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Training on Healthy Meatball Production and Packaging for Meatball MSME in Medan Helvetia

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ABSTRACT
Meatballs are widely produced by MSME and contain high nutritional value, making them popular among the community. Meatballs have a short shelf life at room temperature; therefore, many meatball producers use synthetic preservatives and flavor enhancers. This community service activity aims to provide assistance to meatball MSME on producing healthy meatballs and proper packaging, thereby increasing sales and improving the economy. The methods used in this activity include: (1) counseling on the importance of using natural preservatives derived from spices for health, (2) training on producing healthy meatballs using marination technology with garlic extract and other natural food additives to improve meatball quality, (3) training on meatball packaging by labeling containers according to the type of meatball, and (4) assistance and monitoring. The results of this activity show that meatball MSME partners and counseling participants gained knowledge about the negative health impacts of using synthetic preservatives and flavor enhancers. The partners also learned how to produce healthy meatballs using marination technology with garlic extract and proper packaging to improve product quality, increase sales, and boost the economic performance of meatball MSME. Assistance and monitoring results indicate that the partners are highly interested in applying the outcomes of this community service activity to their meatball businesses.

Keyword: Healthy Meatballs, Garlic Extract, Natural Preservatives, Spices

1. Introduction

Meatballs are processed meat products that are popular among people of all ages, from children to adults. Meatballs are commonly made from beef, chicken, or duck meat. In general, meatballs are often made from broiler chicken because it is widely consumed by the public and is affordable. Meatballs are made by grinding the meat and mixing it with other additional ingredients and seasonings to make them more delicious. In the process of making meatballs, fillers and binders are usually added, then the mixture is shaped into balls and boiled in boiling water. The ingredients used in making meatballs should be safe and healthy for consumption according to the Indonesian National Standard Number 3818:2014 regarding meatball quality requirements, which states that meatballs should be made from minced animal meat mixed with tapioca flour and seasonings, without any unauthorized food additives. Meatballs containing borax are very dangerous to health because they can cause poisoning, skin irritation, respiratory and digestive disorders such as nausea, diarrhea, and stomach pain [1].

The use of chemical preservatives such as formalin and borax is commonly found in meatball products. The use of chemical preservatives is very dangerous to human health because it can cause various serious diseases. The public in general, and meatball vendors in particular, need to be made aware of the importance of using natural preservatives. One natural preservative that can be used in making healthy meatballs is garlic. The application of garlic extract as a natural preservative in meatballs is an effort to produce healthier food. Garlic is a very important natural spice commonly used in cooking because it provides a distinctive taste and aroma. This is due to the presence of allicin, which acts as an antimicrobial, antiviral, and antioxidant compound that

helps maintain body health. Garlic functions as an antioxidant because it contains selenium and organosulfur compounds. It also contains allicin, which serves as an antimicrobial agent that prevents the growth of various microbes responsible for spoilage in meat and meat products. Garlic extract can inhibit the growth of gram-negative bacteria such as *Salmonella spp., Pseudomonas spp.*and *E. coli* [2].

Improving the flavor quality and proper packaging of meatballs is an effort to increase consumer appeal. Good taste in meatballs is not achieved through the addition of chemical flavor enhancers, which may have negative impacts on health. Other natural food additives that can be used in meatball production include ground pepper, sugar, salt, pepper, shallots, and garlic. Meatball flavoring can be enhanced with sugar, salt, and fried shallots. Shallots contain vitamins C, A, and E, beta-carotene, and minerals. According to [3], shallot extract contains polyphenols such as gallic acid, catechin, tannic acid, and kaempferol, which function as antimicrobial agents. Furthermore, [4] stated that the addition of shallots to food has health benefits and produces functional foods due to their antioxidant content.

This meatball MSME (Micro, Small, and Medium Enterprise) is a chicken-based meat processing business located on Perkutut Street, Masjid Ujung Alley, Helvetia Tengah Village, Medan Helvetia District. The partner in this community service activity is a mobile meatball vendor. He has been running this meatball business since 2004. This meatball business is a home-based industry that employs family members. Meatball production is carried out based on experience using simple ingredients commonly used in making meatballs, namely chicken meat, tapioca flour, bread flour, and additional seasonings such as Royco or Sasa and pepper, which are provided by the meatball grinding service. The production process uses flavor enhancers such as royco and sasa. The use of these flavor enhancers is not good for health.

The problem faced by this meatball MSME is that the meatballs they produce do not last long when stored at room temperature. The meatball vendor does not yet understand the importance of healthy food to support human health. They are also unaware of the negative impacts of using synthetic preservatives and flavor enhancers that are harmful to health. The knowledge and skills of this meatball MSME regarding the use of spices and natural ingredients in meatball production—to improve flavor and shelf life—need to be improved. The vendor also does not yet know how to properly package meatballs according to their type to make them look more appealing and attract consumers. This is very important to ensure that more consumers are interested in purchasing the products of this meatball MSME.

This community service activity aims to improve the knowledge and skills of the meatball MSME in utilizing spices such as garlic extract and other natural food additives, as well as packaging techniques, in order to increase meatball sales and improve the local economy.

2. Method

This community service activity was carried out on Perkutut Street, Masjid Ujung Alley, Helvetia Tengah Village, Medan Helvetia District. The method used in implementing this activity consists of four stages:

1) Providing education on the importance of using natural preservatives from spices for health,

2) Providing training on making healthy meatballs using marination technology with garlic extract and other natural Food Additives to improve meatball quality,

3) Providing training on meatball packaging with labeling according to the type of meatball and

4) Assistance and monitoring. “The counseling was carried out using training and lecture methods, followed by a demonstration of making healthy meatballs with garlic extract. The counseling activity was followed by a question-and-answer session between the participants and the presenter. After the counseling session was completed, it continued with a demonstration of making healthy meatballs.

The ingredients used in making healthy meatballs consist of: 1 kg of broiler chicken breast and thigh meat, ½ kg tapioca flour as a filler, 1 ounce of minced garlic, 1 ounce of pepper, 1 ounce each of fried shallots and fried garlic, 1 ounce of salt, 1 ounce of sugar,2 egg whites, 20 ml of garlic extract, and 2 ounces of ice cubes. The community service team then provided training on meatball packaging by labeling the cups according to the type of meatball sold. Meatballs placed in their respective cups were then photographed, and the photos were

turned into a banner to be displayed on the meatball cart. This was done to attract consumer interest in purchasing the meatballs.

3. Results and Discussion

The results of this community service activity include: 1) Socialization on the importance of using natural preservatives and flavor enhancers from spices for health, 2) Knowledge transfer on making healthy meatballs using marination technology with garlic extract and other natural food additives to improve meatball quality, 3) Technology transfer on meatball packaging with labeling on sales cups to make them more attractive to consumers, and 4) Monitoring and mentoring.

At the beginning of the outreach activity, the implementation team provided guidebooks and leaflets to facilitate the process of making healthy meatballs and to emphasize the importance of using spices as natural preservatives and flavor enhancers. The making of healthy meatballs using garlic extract and natural food additives aims to produce healthy food for the community. The use of garlic extract and other natural food additives in making healthy meatballs is an effort to utilize local resources. Increased knowledge and welfare of the community encourages awareness of healthy living. Healthy food leads to a healthy body and contributes to the development of intelligent and smart younger generations. The outreach participants included partners, meatball vendors, and housewives living near the partners' residences.

During this community service activity, the team provided education about the dangers of using synthetic preservatives, which can cause various diseases. The team informed the partners and participants that synthetic preservatives are very dangerous to health. Synthetic preservatives are often found in snack foods such as meatballs. Borax is frequently used as an additive in meatball production to improve texture, enhance flavor, and extend shelf life. Consuming meatballs containing borax does not have immediate negative effects, but it can accumulate gradually in organs such as the brain, testes, and liver. Borax absorbed by the body in small amounts is excreted through feces and urine, and very little through sweat. In addition, borax can interfere with metabolic enzymes [5]. Consuming a large amount of borax can cause symptoms such as vomiting, dizziness, diarrhea, kidney damage, abdominal cramps, and loss of appetite. Many snack foods sold in the market contain formalin and borax, as well as artificial dyes such as rhodamine B and metanil yellow. The use of hazardous food additives can have serious negative effects, such as gastroenteritis and liver, kidney, and neurological disorders. The most dangerous long-term effect of consuming food containing formalin is the development of diseases [6].

On this occasion, the outreach team encouraged participants to use spices as natural preservatives that are safe for health. The team introduced types of spices that can be used as natural preservatives in meatball products and food in general, including garlic, shallots, ginger, lemongrass, and others. These spices can also be applied to food products or fresh and processed meat products, such as goat, buffalo and beef to produce processed foods such as meatballs, sausages, nuggets and others.

There were 10 participants in this outreach activity, consisting of mobile meatball vendors, stationary meatball vendors, and housewives living around the partners' homes. Approximately 60% of the participants understood the importance of utilizing spices in food products and their effect as natural preservatives, because they had previously only known spices as herbal remedies. The participants had not realized the presence of synthetic preservatives such as formalin in food products like meatballs, sausages, and nuggets, which are very harmful to health. This outreach activity has broadened the participants' understanding of synthetic preservatives in snack foods and their severe health risks. In 2015, the Gorontalo Food and Drug Supervisory Agency (BPOM) conducted a study and found that 15% of food products tested positive for borax, formalin, rhodamine B, and methanyl yellow. In 2017, four food product samples were found to be unfit for consumption out of 412 samples tested [7].

The percentage of outreach participants who recognized types of spices that can be used as natural preservatives through marination technology was 60%, because participants had previously underutilized spices for food preservation and were unfamiliar with marination technology. Participants only knew spices as cooking seasonings and used refrigerators to store food to extend shelf life. Through this outreach, participants became familiar with marination technology, where various types of spices can improve meat quality and increase shelf life or preservation. According to [8], marination is a solution containing seasonings that involves soaking in liquid, raw, or cooked spices that contain various additional compounds such as acids,

enzymes, and other spices. Marination aims to improve color, flavor, texture, tenderness, palatability, and extend the shelf life of meat. Garlic is one of the spices that can be used in marination because it contains allicin, which functions as an antimicrobial.

The percentage of participants aware of the health hazards of synthetic flavor enhancers was 65%, as participants were accustomed to using synthetic seasonings such as ajinomoto, royco, Masako and others. These flavor enhancers are very harmful to health because they contain MSG (Monosodium Glutamate). Through this outreach, participants learned about the negative effects of consuming foods containing synthetic flavor enhancers and began to reduce their use, switching to natural ingredients or spices as safe and healthy flavorings. According to [9], Monosodium Glutamate (MSG) is a sodium salt compound that functions to enhance the flavor and shelf life of food. Excessive use of MSG can cause dizziness and nausea. The use of this synthetic flavor enhancer should be limited and replaced with natural flavorings that are safe for public consumption. According to [10], spices contain many polyphenols that function as antioxidants and enhance the flavor of food. Black pepper contains phenolic bioactive compounds that help reduce oxidation in beef. In addition, black pepper has antioxidant content that can reduce rancidity and odor in beef. Furthermore, according to [11], the addition of garlic or shallots increases the amount of sulfur compounds in meat, where organosulfur compounds and their precursors play a significant role in enhancing the aroma and flavor of raw beef.

Meatball vendors and outreach participants were not aware of the importance of marination technology in preserving meatballs, allowing them to be stored longer at room temperature (27°C). Meatballs marinated with garlic extract are not only more durable but also have increased protein content. This is because garlic contains allicin, which has antimicrobial properties, and allicin itself is composed of proteins, resulting in higher protein content in marinated meatballs. Marination technology can also be applied to fresh meat processing, especially for meat of lower quality, such as spent layer chicken. Meat that is tough, odorous, or of lesser quality can be improved so that it becomes safer and of higher quality for consumption.

The percentage of outreach participants who recognized types of spices that can be used as natural preservatives with marination technology was 60%, as participants had limited knowledge of using spices for food preservation and were unfamiliar with marination technology. Participants previously only knew spices as cooking seasonings and relied on refrigerators to prolong food shelf life. Through this outreach, participants learned that marination with various spices can improve meat quality and extend shelf life. According to [12], marinating beef with a 40% garlic extract solution at pH 5.9 for 15 minutes reduces the total microbial count and total coliforms, and increases the water-holding capacity of the beef after being stored for 8 hours at room temperature. Documentation of the outreach activity can be seen in Figure 1 below:

Figure 1. Implementation of the Outreach Activity

3.1. Training on Making Healthy Meatballs

Meatballs are processed meat products that are an excellent source of protein; therefore, the preparation process and ingredients used must be carefully considered and healthy. Healthy meatballs can be made by adding natural ingredients aimed at improving the physicochemical quality, flavor, and shelf life of the meatballs. Natural ingredients that can be added to meatballs include spices such as garlic, shallots, ginger, lemongrass, and others. Healthy meatballs can also be made by adding natural ingredients such as celery leaves, garlic, pepper, shallots, sugar, and salt. Garlic contains natural antibiotics, such as aliin and alicin, which not only inhibit the growth of spoilage bacteria but also enhance aroma and delicious flavor. Fried shallots improve the aroma and taste of meatballs because they contain 35% fat and 42% carbohydrates. Fried shallots can enhance the aroma, flavor, and texture, making the food more delicious [13]. Garlic and shallots should be added at

5%–7.5% of the total ingredient composition in meatball production to produce meatballs with a rich onion flavor and high antimicrobial activity [14].

The demonstration or training process for making healthy meatballs and preserving them begins with preparing garlic extract. About 200 g of garlic is blended or juiced and then pressed to obtain the extract. The steps for making healthy meatballs are as follows: (1) Chicken meat is ground using a meat grinder with added ice, (2) Once the meat is ground, pepper, minced garlic, shallots, fried garlic and shallots, sugar, and salt are added, 3) Re-cover until smooth and homogeneous. 4) As a filler and binder for the components, tapioca flour and egg white are added, then mixed until homogeneous and alkaline. Next, prepare a pot for cooking the meatballs. Water is heated in the pot until it boils, then the alkaline mixture is shaped into balls by hand, with the help of a spoon, and immediately placed into the boiling water. The meatballs are fully cooked when they float to the surface and can be removed with a strainer. They are then immediately placed in garlic extract solution for marination for 15 minutes and drained afterward. This marination process allows the garlic compounds to penetrate the meatballs, so that the allicin in garlic can inhibit the growth of pathogenic bacteria, enabling the meatballs to be stored longer at room temperature. The drained meatballs are then distributed to the outreach participants. The participants were enthusiastic about observing the healthy meatball-making demonstration. Documentation of the demonstration can be seen in Figure 2 below:

Figure 2. Demonstration of Healthy Meatball Making

The healthy meatballs produced during this outreach activity were then given to the participants for tasting. Each participant took the meatballs that had been served, consumed them, and provided feedback on the meatballs produced during this activity. Documentation of the meatballs produced in this outreach activity can be seen in Figure 3 below:

Figure 3. Healthy Meatballs Produced from the Outreach Activity

The outreach team then asked the participants to evaluate the meatballs they had consumed in terms of quality. The participants assessed that the meatballs produced during this activity had an appealing color, savory and delicious taste, as well as a chewy and tender texture. The color of the meatballs was light and bright gray, which is due to the higher proportion of meat compared to tapioca flour. According to [15], chicken meatballs turn gray due to the denaturation process of myofibrillar proteins and water evaporation during heating, which causes the meat color to change to gray when the cooking temperature exceeds 85–90°C. Furthermore, this gray color indicates that the meat-to-tapioca flour ratio in the meatballs was appropriate, specifically twice the amount of tapioca flour, which allows the meat color to be more prominent in the resulting meatballs. This bright gray color is generally preferred by consumers. Documentation of participants tasting the produced meatballs can be seen in Figure 4 below:

Figure 4. Outreach Participants Tasting the Healthy Meatball

The savory and delicious taste as well as the fragrant aroma were produced from the addition of fried shallots and garlic, along with sugar and salt. The addition of fried shallots and garlic enhances the aroma and savory flavor of the food. Fried shallots provide aromatic quality and a distinctive taste that complements and enhances the flavor characteristics of the meatballs. According to [16], garlic that has been processed at temperatures of 65–90°C for a certain period develops a brown color, a richer flavor, and has high antioxidant content. The total phenolics in the garlic increase 4–10 times compared to fresh garlic. The contents of polyphenols, flavonoids, and antioxidant activity are 58.33 mg GAE/g, 15.37 mg RE/g, and 74.48%, respectively. Furthermore, according to [17], this garlic also has antimicrobial and antioxidant activities that function to prevent free radicals in the body and rancidity in food. The outreach participants concluded that the produced meatballs were very delicious even without synthetic flavor enhancers, because in addition to fried shallots and garlic, natural seasonings such as sugar and salt had been added.

The meatballs produced were chewy and tender because the chicken meat used was fresh, allowing it to bind water and integrate well with other ingredients. According to [18], fresh meat is meat that is cut immediately after slaughter, while the carcass temperature and pH are still high and before rigor mortis occurs. This condition ensures a high myofibrillar protein content, which plays an important role in improving meat quality, including water-holding capacity, gel formation and emulsion properties. The outreach team emphasized that the meat used should be fresh or newly slaughtered, not aged or wilted, as aged meat results in less elastic meatball texture and may contain fat and bone residues.

3.2. Meatball Packaging Training

The outreach team explained that good packaging can attract consumers, thereby increasing meatball sales. The meatballs packaging produced by the partner had previously only been packaged in plain cups without labels, leaving consumers unaware of the different types of meatballs being sold. Through this community service activity, the team provided education on meatball packaging by creating labels on meatball cups according to the types of meatballs sold. The types of meatballs offered by the partner include:1) Fried meatballs, which are re-fried to enhance flavor and shelf life, 2) Fried tofu, which is yellow tofu stuffed with meatball filling and then fried, 3) Meatballs with fried tofu, served with broth and sauce, 4) Large chicken-filled meatballs, which are larger because they contain chicken meat inside, 5) Large egg-yolk–filled meatballs, which are large meatballs filled with boiled egg yolk, 6) Noodle meatballs with sauce, consisting of meatballs mixed with noodles and sauce, 7) Meatball soup with noodles. Documentation of the meatball packaging activity conducted by the outreach team can be seen in Figure 4 below:

Figure. 4. Types of Meatballs Sold by the Partner

The meatballs packaged in labeled cups according to the types being sold were then photographed. These photos were also made into a banner and displayed on the partner's meatball cart. In addition, they can be compiled into a laminated menu book so that consumers can easily see the available varieties. This effort was carried out to attract more customers to buy the meatballs. Meatball vendors can attract consumer interest by applying creativity in product presentation and marketing strategies. Vendors can create appealing dish presentations or offer promotions so that customers are encouraged to buy more. Good packaging is an effort to present products more attractively so that more consumers are interested in purchasing them. This is an effort to improve marketing. According to [19], the appearance of meatballs greatly influences consumer interest; even if the taste is good, if the appearance is unattractive or vice versa, consumers may be reluctant to purchase the product. Therefore, optimal creativity and innovation are needed to make meatballs look appealing and taste delicious, encouraging customers to buy again. This has a positive impact on the income of meatball vendors and improves marketing outcomes. The results of the assistance and monitoring by the service team showed that the outreach participants, especially the partner, were very enthusiastic about participating in the counseling and the healthy meatball-making demonstration. The partner intends to apply this healthy meatball production method in their daily business activities. The partner realized that spices are highly beneficial in producing healthy and high-quality food products. The partner has begun applying marination technology using garlic extract to extend the shelf life of meatballs at room temperature. The partner has also become aware that the use of synthetic preservatives and artificial flavor enhancers is very dangerous to human health, as they can cause various chronic diseases common in society. Furthermore, the partner has begun implementing proper meatball packaging in their business to attract more customers. The partner understands that good packaging will increase sales, improve the economy, and enhance the welfare of meatball vendors.

4. Conclusion

The meatball MSME, as partners in this community service activity, have received knowledge transfer about the importance of using spices as natural preservatives and flavor enhancers for health. The partners have also received technology transfer on making healthy meatballs using garlic extract marination as a natural preservative and on meatball packaging by labeling the meatball cups. Improving the quality of the meatballs and proper packaging can increase consumer appeal and meatball sales.

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