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Chemical and Microbiological Aspects of Meatballs in Tabanan City, Bali

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Abstract

This study aims to determine the safety of meatball circulating in Tabanan city in terms of chemical aspects and microbiological aspects referring to the Indonesian National Standard 3818: 2014 concerning bakso (meatball). This research was conducted at the Agriculture Laboratory of the Faculty of Agriculture, Universitas Warmadewa and Denpasar Veterinary Center. This research is an exploratory study that uses experimental design in a laboratory with descriptive analytics. The aspects analyzed were chemical aspects including borax, formalin and microbiological aspects including Escherichia coli and Total Plate Count (TPC). Based on the results of a survey of the number of bakso traders in Tabanan City, 27 traders from 27 traders were taken as many as 14 samples. The test results showed no positive results on borax and formalin testing while the identification of Escherichia coli contamination obtained an MPN value of $\leq 0.30 \text{ APM} / \text{g}$ this MPN value fulfilled the requirements of E. coli contamination according to SNI 3818: 2014 concerning meatball because it did not exceed contamination quality requirements E. coli on bakso for <math>< 3 \text{ APM} / \text{g}</math>. In the aim of TPC the highest value is obtained at $4.1 \times 10^3 \text{ cfu} / \text{g}$ while the TPC value permitted by SNI 3818: 2014 concerning Meat Bakso is $1 \times 10^5 \text{ cfu} / \text{g}$. Based on the results of data from borax, formalin, Escherichia coli and Total Plate Count analysis on meatball circulating in Tabanan City, the results of the test parameters meet the standards of SNI 3818: 2014 concerning meatball.

Keywords: Borax and Formalin, Meatball, Microbiology aspects

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1. Introduction

Food safety is a condition and effort needed to prevent food from possible contamination of biological, chemical and other objects that can disempower, harm and unsafe for human health (1). Lack of awareness and education level of the community or producers of food products that are low on the importance of food security is one thing that results in a sense of lack of care for the quality of food produced or consumed, meatball are foods made from meat, usually made from beef, chicken, fish, or shrimp. In the manufacturing process, food additives are often added to meatball. In addition to natural and synthetic chewy ingredients, there are also manufacturers of meatball that still use chewy ingredients that are forbidden, such as borax and formalin (2).

Borax and formalin on meatball products are usually used by producers so that the resulting meatball can long lasting and provide a color or appearance of meatball looks whiter or cleaner, so that it looks more attractive (3). In addition, identification of borax and formalin food security is also determined by the quality of sanitation and hygiene. Sanitation and cleanliness will determine the amount of microbial contamination that can be infected by E. coli and can cause illness for consumers' health (4).

2. Materials and methods

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1. Introduction

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Borax and formalin on meatball products are usually used by producers so that the resulting meatball can last long and provide a color or appearance of meatballs that look whiter or cleaner, so that it looks more attractive (3). In addition, identification of borax and formalin food security is also determined by the quality of sanitation and hygiene. Sanitation and cleanliness will determine the amount of microbial contamination that can be infected by *E. coli* and can cause illness for consumers' health (4).

2. Materials and methods

Location and time of research

This research conducted at the Food Analysis Laboratory of the Faculty of Agriculture, Universitas Warmadewa and Denpasar and place of Veteriner Denpasar. This research was conducted from September, 2018 – October, 2018.

Materials and Equipments

Borax Reagent, phenylhydrazine solution 0,5%, sodium nitroprusside solution 5%, sodium hydroxide solution 10%, formalin standard (Cat PS-2031) purity 37 Wt.%, distilled water, BPW (Buffered Pepton Water) 0,1%, BGLBB (Brilliant Green Lactose Bile Broth) , LSTB (Lauryl Sulfate Tryptose Broth), ECB (Escherichia coli Broth), L-EMBA (Levine Eosin Methylene Blue Agar) MR-VP (Methyl Red-Voges Proskauer), PCA (Plate Count Agar) KCB (Koser Citrate Broth), SCA (Simmons Citrate Agar), Reagen Kovac, Reagen Voges-Proskauer (VP), BPW 0,1% (Buffered Pepton Water 0,1%)

The tool used in this research are Borax Rapid Test Kit, Durham tube, Petri dish, test tube, pipette size 1 mL, 2 mL, 5 mL, 10 mL, media bottle, scissor, tweezers, inoculation cursor, stomacher, Bunsen burner, pH meter, scale, magnetic stirrer, vortex, incubator, water bath, autoclave, clean bench, refrigerator, freezer, volumetric pipette, colony counter.

Research design

This research is an exploratory study that uses experimental design in the laboratory. This type of research is descriptive analytical. The population in the study was obtained by survey by census, namely 27 traders in Tabanan City. Based on the number of merchant data, the sample data will be taken as much as 50% taken randomly. Meatball samples taken randomly will be taken in hot conditions. The sampling technique from each trader is taken twice, when during the day. The first take is done for the first test and the second take is done for repetition. Data retrieval is done by using chemical and microbiological analysis methods which include identification of borax, formalin and analysis of E. coli microbial contaminants and total microbial analysis.

Research Implementation

The stages of this research consisted of sampling, borax identification, formalin identification, identification of E. coli bacteria, calculation of Total Plate Count (TPC) and data analysis. Borax analysis was carried out with qualitative methods using the Borax Rapid Test Kit. Based on the procedure instructions for using the Borax Rapid Test Kit and according to the reference AOAC (*Association of Official Analytical Chemists*) the detection limit of the Rapid Test Kit is 5 mg/L. Formalin analysis was carried out using qualitative methods. This testing method is by reacting phenylhydrazine solution, sodium nitroprusside solution, sodium hydroxide solution which will form complex compounds with blue color. Analysis of E. coli contaminants was carried out using the Most Probable Number method refer to (5) about methods of testing microbial contamination in meat, eggs and milk, and their processed products. The Total Plate Analysis method will use calculations Total Plate Count refer to (5).

Data analysis

Based on the results of the research data obtained will be carried out descriptive analysis. Descriptive analysis carried out will refer to (6) about meatball quality standards. From the results of this

analysis will be known the level of safety of meatball circulating in the city of Tabanan which will be reviewed from the chemical aspects and microbiological aspects.

3. Results and Discussion

Based on the results of chemical and microbiological analysis of meatball samples circulating in Tabanan City, the data obtained from the analysis results are as follows as shown in Table 1.

Table 1.

Average Results of Analysis of Borax, Formalin, Escherichia coli and TPC on meatball circulating in Tabanan City

Traders	Averages			
	Borax	Formalin	Escherichia coli	TPC (cfu/g)
I	Negative	Negative	< 0.30	$3,9 \times 10^2$
II	Negative	Negative	< 0.30	$6,5 \times 10^2$
III	Negative	Negative	< 0.30	$2,0 \times 10^2$
IV	Negative	Negative	< 0.30	$2,2 \times 10^2$
V	Negative	Negative	< 0.30	$9,1 \times 10^2$
VI	Negative	Negative	< 0.30	$8,3 \times 10^2$
VII	Negative	Negative	< 0.30	$1,5 \times 10^3$
VIII	Negative	Negative	< 0.30	$3,4 \times 10^3$
IX	Negative	Negative	< 0.30	$1,4 \times 10^3$
X	Negative	Negative	< 0.30	$1,6 \times 10^3$
XI	Negative	Negative	< 0.30	$5,8 \times 10^2$
XII	Negative	Negative	< 0.30	$2,8 \times 10^3$
XIII	Negative	Negative	< 0.30	$4,1 \times 10^3$
XIV	Negative	Negative	< 0.30	$2,1 \times 10^3$

Based on Table 1, the results of analysis of borax compounds on meatball circulating in Tabanan City showed negative results. Negative results from this analysis show that meatball circulating in the city of Tabanan do not contain Borax compounds. Based on the survey data on the characteristics of sellers, it is obtained that the traders' education data is not high. Usually someone with a low level of education has knowledge of attitudes and practices that are generally limited and only refers to experiences and habits that are carried out every day from generation to generation. However, along with the development of information technology, information about the dangers of borax does not have to be obtained from formal education. The sellers claimed to get information about the dangers of borax through electronic media so that they understood the acceptable risks when using borax in food.

The results of the analysis of formalin compounds on meatball circulating in Tabanan City showed negative results. This negative result was supported by the results of a survey which showed that the seller of meatball in the Tabanan City had understood that formalin was not a food additive. This information is obtained through electronic media so that they understand the risks that can be accepted when using formalin in food. The results of interviews with traders, the meatball they sell are self produces meatball and some traders claim the meatball they sell are meatball owned by collectors. Traders say the meatball they provide every day are almost always sold out, and there are some said not sold out. If the meatball not sold out, the traders will be save it in refrigerator so they are durable and sell in next day. So that the producer or seller of meatball claimed not to use preservatives such as formalin when produce meatball.

The results of the analysis of *E. coli* bacteria contamination obtained results that showed that from the whole sample there was no contamination from *E. coli* bacteria. Not identified of *E. coli* bacteria is likely due to the samples taken for testing in hot conditions. *E. coli* bacteria, may have died during the process of heating or making meatball. The heat condition causes the growth of bacteria in the sample to die because *E. coli* bacteria can die at 70°C (7). Based on the results obtained after laboratory tests, identification of *E. coli* bacteria in meatball circulating in Tabanan City obtained MPN values of <0.30 APM / g of this MPN value fulfilling the requirements of *E. coli* contamination according to SNI 3818: 2014 about meatball.

Based on the results of Total Plate Count meatball analysis in Tabanan, the data shows that the amount of microbial contamination does not exceed the quality standards that refer to (6) concerning meatball as big as 1×10^5 cfu/g. The data shows that the average number of TPC obtained in the highest test is obtained in the trader sample XIII and the lowest TPC value is obtained in the merchant sample III. The average TPC value of per sample does not exceed the standard SNI 3818: 2014 concerning meatball, which is 1×10^5 cfu/g. This is probably due to the samples taken to be tested in hot conditions. The heat condition causes the bacteria in the sample to die (8). In another side the meatball sample has a boiling process that is capable of killing bacteria. By still obtaining a TPC value on the sample shows the possibility of cross-contamination from the environment against meatball samples (9).

4. Conclusion

From the meatball samples taken in Tabanan city which were chemically and microbiologically analyzed, the results showed that the outstanding meatball samples did not contain borax and formalin (negative). The results of identification of *E. coli* bacteria in meatball circulating in Tabanan City obtained an MPN value of <0.30 APM/g This MPN value meets the requirements of contamination *E. coli* refers to SNI 3818 : 2014 about meatball because it does not exceed the quality standards of *E. coli* contaminants on meatball whose value is as big as <3 APM/g. *Total Plate Count* on meatball taken in Tabanan City shows the highest average value of $4,1 \times 10^3$ cfu/g and lowest value is $2,0 \times 10^2$ cfu/g so that it does not exceed the quality standards refer to SNI 3818 : 2014 about meatball whose value is as big as 1×10^5 cfu/g.

Based on the results of data on borax, formalin, *Escherichia coli* and Total Plate Count on outstanding meatball in Tabanan City, the results of the test parameters meet the standards of SNI 3818: 2014 concerning meatball.

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