



The Analysis of Formaldehyde Content in Chicken Meatballs Sold in Ambon City

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ABSTRACT

This study aims to determine the presence or absence of formalin in chicken meatballs sold in Ambon City. The research was conducted at the Animal Product Technology Laboratory, Faculty of Agriculture, Pattimura University. The method used in this study was descriptive qualitative with a focus on qualitative formalin content testing to determine the presence of formalin in the meatball samples tested. The variable observed in this study was the qualitative formalin content of meatballs or the presence or absence of formalin in meatballs. The results showed that 5 out of 10 meatball samples tested contained formalin, based on The results of the formalin qualitative test using the KIT Test and the test using turmeric extract. This finding reflects the use of formaldehyde in meatball products that can endanger consumer health

INTRODUCTION

Meat is rich in nutrients, so it is easy to be damaged by microorganisms. One way to maintain or reduce meat spoilage is through the processing process. One of the processed meat products that is very popular and loved by consumers is meatballs.

Meatballs are a type of processed food made from minced meat, and given fillers, as well as spices. Meatballs can be made from beef, chicken, fish, or rabbit meat (Kemendikbud, 2018). Meatballs is one of the protein source foods that is favoured by almost everyone. Foods that contain protein usually spoil easily, so it is not uncommon for traders to use preservatives in making meatballs. The purpose of using preservatives in food products such as meatballs is as an antimicrobial or antioxidant that functions to prevent food from becoming rancid caused by chemical changes in the food (Mauboy et al., 2020).

One of the banned chemicals that is often used as a preservative is formalin. Formalin is familiar because it is very commonly used in life. In the industrial world, formalin has many benefits such as anti-bacterial or germicidal, so formalin is often used as a floor cleaner, ships, warehouses, clothes and even used as a fly repellent and other insects. Formalin concentrations of less than 1% are used as preservatives for various non-food ingredients such as dish soap, softener, car shampoo, candles and carpets (Winarno, 2012).

Regulation of the Minister of Health No. 033 of 2012 concerning Food Additives (BTP) prohibits the use of formalin, yet many studies have shown that many vendors still use formalin in processing their goods. The use of formalin is banned because of the effects it can cause if food contains formalin, such as stomach pain and vomiting, headaches, seizures, unconsciousness, damage to the nervous system, kidney damage, and other effects. Formalin that

Accumulates in cells reacts with cellular proteins (enzymes) and DNA (in mitochondria and the nucleus). The use of formalin in food poses serious health risks both in the short and long term. This depends on the dosage and period of exposure in the body. Some short-term negative consequences attributable to formalin exposure include irritation of the respiratory and digestive tracts, vomiting, and disorientation. Prolonged consequences may result in premature aging and harm to the heart, liver, kidneys, lymph nodes, and pancreas. The mucous lining of the respiratory and digestive systems is susceptible to a rapid reaction with formalin. In the body, it is rapidly oxidized to create formic acid, predominantly in the liver and red blood cells, which increases blood acidity, causes rapid and shallow breathing, hypothermia, coma, and even death. Use of formalin in food can lead to poisoning in humans, such as acute stomach pain accompanied by vomiting, central nervous system depression, or circulatory failure (Ministry of Health RI, 2012).

Formalin is a dangerous chemical that is carcinogenic and mutagenic, which means it can cause changes in cells and body tissues, has irritative and corrosive properties. Formalin vapor is harmful when inhaled and causes irritating effects when ingested. The negative effects of formalin can also damage the nervous system and interfere with reproductive health (Sajiman et al, 2015).

Formalin is a chemical compound used as a disinfectant and in various industries. In food, formalin is often used to preserve, so that it lasts longer. However, the use of formalin in food is very dangerous because it can damage cells and cause cell death (Mahmudah, 2023). Based on BPOM data in 2010, out of 786 food samples tested, meatballs, fish, and tofu ranked top for containing formalin and borax (Putra, 2021; Ati et al., 2024).

Formalin, which is generally used as a non-food preservative, is often misused to preserve food products such as tofu, noodles and meatballs due to its wide availability and affordable price. This misuse occurs because the chemical is easy to obtain and relatively cheap, so some traders use it without considering the health impacts that can be experienced by consumers (Fitri et al., 2021).

LITERATURE REVIEW

In 2016 the results of the BPOM daily report in Southeast Sulawesi Province stated that out of 1263 samples tested, 0.07% contained formalin. Based on Sari's research (2022) in Makassar City, 4 out of 30 meatball samples were positive for formalin. Fitri (2014) also found 2 out of 4 meatball samples were positive for formalin. Research on formalin analysis in meatballs in Palu City conducted by Dinda (2018) found that 9 meatball samples (52.9%) were positive for formalin. Meatballs are one of the popular and preferred foods in Indonesia, both children and adults. Monitoring of formaldehyde in these products must continue to protect consumers. The use of formaldehyde test kits is an important tool to detect the presence of formaldehyde in food, helping to ensure that the products consumed are safe and in accordance with health standards quickly (Yulianti, 2021).

METHODOLOGY

Place and Time of Research this Research

was conducted at the Laboratory of Livestock Products Technology, Faculty of Agriculture, Pattimura University from July to August 2024.

Tools and Materials

The equipment used in the study was a formalin detector (Test Kit) Labtest Brand In addition, there were several equipment used, including test tubes (Pyrex), test tube racks, 100 mL beaker glass, 220 gram capacity electric scales (Shimadzu), blender, measuring cups 5, 10 mL (Pyrex), filter paper, funnel (Herma), drop pipette, stirring rod.

The materials used in this study were meatball samples obtained from meatball traders in 10 different places in Ambon city. The meatball traders or restaurants are very popular and favored by many customers.

Research Methods

The method used in this study used descriptive qualitative method Qualitative test of formalin content of meatball samples using Labtest Brand formalin test kit test and turmeric extract.

Formalin Content Test with Test Kit

Meatball samples were taken from traders at meatball eating places then put in plastic and labeled, then taken to the laboratory. Meatball samples were sliced and then put into a mortar and mashed. Samples that have been smooth, weighed as much as 25 g and then put in a glass beaker measuring 50 ml, then add aguades and stir until evenly mixed, and leave \pm 1 minute.

Take test tube 1 and input 3-4 drops of formalin standard and dilute using distilled water as much as 3-5 ml. Take the second test tube filled using 3-5 ml of sample, add formalin reagent 1 as much as 3-4 drops and then homogenize. Add 3-4 drops of formalin 2 reagent to each test tube and homogenize. Add another 3-4 drops of formalin 3 reagent to each test tube and homogenize. Allow to stand for 15 minutes and observe, if a purple color is formed, then the sample contains formalin. The purple color of the sample in the test tube is compared with the formalin color series in the test kit.

Formalin Content Test with Turmeric Extract

Each sample was weighed as much as 5 g and then the sample was mashed using a mortar and pestle. Samples that have been finely put into a test tube, then add with 5 ml extra turmeric and homogenized. Then see the color change that occurs in each sample. A color change to brownish red indicates a positive sample of formalin, if there is no color change then the result is negative. Observed Variables The observed variable in this study is the formalin content in meatballs.

Data Analysis

The data obtained were analyzed descriptively qualitatively, by describing the results seen in the test kit (positive/negative) and the results were tabulated.

RESULTS AND DISCUSSION

Formaldehyde Test Using Test Kit

The formaldehyde content of meatball samples tested with the test kit taken from meatball vendors in several places in Ambon City, can be seen in Table 1 below.

Table 1. Qualitative Test Results of Formalin Content in Several Meatball Vendors/Stalls in Ambon City, Tested Using the Test Kit

No	Code meatball traders/stalls	Location	Formalin content
1.	MA	Wayame	Negative
2.	PRAS	Poka	Positive
3.	PA	Mcm	Positive
4.	M.J	Mardika	Negative
5.	MJH	Pasar rumah tiga	Positive
6.	MJR	Galala	Positive
7.	MY	Poka	Negative
8.	PAM	Waiheru	Positive
9.	MR1	Batu Merah	Negative
10.	MR2	Kota jawa	Negative

Formalin Test Using Turmeric (*Curcuma Domestica*)

The formalin content of meatball samples tested with turmeric (*Curcuma domestica*) taken from meatball traders/stalls in several places in Ambon City, can be seen in Table 2.

Table 2. Qualitative Test Results of Formalin Content in Several Meatball Restaurants in Ambon City, Tested Using Turmeric

No	Code meatball traders/stalls	Location	Formalin content
1.	MA	Wayame	Negative
2.	PRAS	Poka	Negative
3.	PA	Mcm	Negative
4.	M.J	Mardika	Negative
5.	MJH	Pasar Rumah Tiga	Negative
6.	MJR	Galala	Negative
7.	MY	Poka	Negative
8.	PAM	Waiheru	Negative
9.	MR1	Batu Merah	Negative
10.	MR2	Kota Jawa	Negative

In Table 1, the test for formaldehyde content in meatballs from several meatball vendors, tested qualitatively using the test kit, showed that 5 meatball vendors (PRAS, MJH, MRJ, MCM, and PAM) were positive for formaldehyde, while the other meatball vendors were negative.

In Table 2, the borax content of the same meatball samples from several meatball vendors/stalls that were tested qualitatively using turmeric were all negative.

These two qualitative test methods, both using the test kit and using turmeric, show that meatball stalls in Ambon City relatively do not use formalin in the processing and preservation of meatballs except in meatball stalls (PRAS, PA, MJH, MRJ, MCM, and PAM).

The use of two test methods, this qualitative shows that the kit test is more effective in detecting the presence of formalin in meatballs. while the formalin test using natural ingredients (turmeric) is not effective, because turmeric is not used directly to analyze formalin content, but can be used as an indicator to detect the presence of borax Bisyaroh (2019).

The use of turmeric extract as a natural indicator to detect borax in foods, such as meatballs, is based on the content of curcumin compounds in turmeric. Curcumin can react with borax to form a pink or reddish-brown complex compound, indicating the presence of borax. However, turmeric cannot be used to detect formalin directly.

Instead, testing for formalin in food is usually done using chemical methods such as the use of potassium permanganate (KMnO). In this test, if formalin is present, there will be a color change from purple to clear, indicating the presence of formalin in the sample

Therefore, turmeric is effective as an early indicator to detect borax, but cannot be used to detect formalin Bisyaroh (2019).

Formalin, which is often misused as a food preservative, is very dangerous if consumed in excessive amounts. In the long term, it can cause disruption to the digestive system, kidney damage, and an increased risk of cancer. Although formalin has antimicrobial properties that make it used as a preservative, its use in food products is strongly discouraged due to its adverse health effects.

The presence of formaldehyde in meatballs can be used with the intention of extending the shelf life of the product and maintaining the freshness of the meatballs, as well as thickening the meatballs, but this is a very risky practice for consumers. This is in line with the opinion of several experts such as Ismail et al. (2016), who said that the use of formalin in meatballs aims to extend the shelf life of the product, so that the meatballs are not quickly damaged or stale. Formalin works by inhibiting the growth of bacteria and microorganisms that cause decay. However, the use of formalin in food is very dangerous because it can cause serious health problems, such as irritation of the digestive tract, damage to internal organs, and even the risk of cancer if consumed in the long term.

Then according to Firmansyah (2020), the use of formalin in meatballs aims to maintain the freshness of meatballs and product shelf life so that meatballs do not spoil easily and can last longer. Formalin has properties as a preservative that can inhibit the growth of microorganisms, but its use in food is very dangerous for health. Long-term consumption of formalin can cause health problems such as internal organ damage, digestive disorders, and the risk of kidney cancer.

According to Tiven (2020), the use of formaldehyde in meatballs aims to thicken the texture to make it chewier and more durable. Formalin, which is a formaldehyde solution, is often misused in food as a preservative and additive, although it is harmful to health. Long-term consumption of formalin can cause serious health problems, such as damage to internal organs, irritation of the digestive tract, and even cancer risk. Therefore, the use of formalin in meatballs or other foods is prohibited by the government and health agencies.

CONCLUSION AND RECOMMENDATION

Considering the findings of the examination of formalin content in meatballs in several meatball shops in Ambon City, it is known that of the ten samples that have been tested using the test kit, five samples in several meatball shops are positive (containing formalin), while the ten meatball samples tested using turmeric are negative (not containing formalin).

FUTHER STUDY

This research still has delays, so further research is needed on the topic of The Analysis of Formaldehyde Content in Chicken Meatballs Sold in Ambon City to improve this research and add insight for the readers.

REFERENCES

- Bisyaroh, N. (2019). Effect of PVP Addition on Curcuma longa L. Natural Indicator to Detect Borax in Meatballs. *Journal of Tinctura Pharmacy*, 1(1), 21-25.
- Dinda, T. A. (2018). Analysis of Borax and Formalin Content in Meatballs at Jalan Penggaraman Kelurahan Talise, Mantikulore District, Palu City. *KH Nutrition Journal*, 1(1): 38-41 ISSN 2460-6855.
- Emi yulastuti (2012). Effect of Tempeh Flour as Beef Substitute on Proximate Composition and Acceptability of Meatballs (Doctoral dissertation, University of Muhammadiyah Surakarta).
- Firmansyah M. 2020. applied an edible coating to chicken meatballs. *Edufortech* 5(2): 1-9
- Fitri, Z. E., Kurniawan, M. F., & Kusumaningrum, I. (2021). Analyzing food safety by determining the amount of formalin, borax, and Escherichia coli in meatballs
- Fauziyah. 2013. Food Safety Assessment of Meatballs and Cilok Circulating in the University of Jember Environment in Review of Borax, Formalin Content.
- Ismail, I., et.al Anuar, M. S. and Shamsudin, R. (2016). Effect on physicochemical properties of meatballs at room temperature storage. *International Journal of Food Research* 20(1): 255-264

- Irvanda, M. N. (2018). Examination of Formalin and Microbial Contaminants in Meatballs Sold in Several Traders in Bireuen Regency. *JIMVET*, 2(4):524-531
EISSN: 2540-9492.
- Kemendikbud, R., and K. B. S. D. M. Kemendikbud. "Ministry of Education and Culture of the Republic of Indonesia." (2018).
- Mauboy, R., Amalo, D., Danong M. T., Bimusu, T. E. 2020 Qualitative Analysis of Formalin in Beef Meatballs Sold in Kupang City Traditional Market. *Biotropical Science Article*. Vol 17(3):10-12.
- Mahmudah, G. R. (2023). Identification of Hazardous Food Additives (Btm Formalin, Rhodamine B, and Borax) in Foods That Are Widely Traded in the Upper Market of Cimahi City. *Kartika Health Journal*, 18(2).
<https://doi.org/10.26874/jkkes.v18i2.275>
- Purwanti, A., Siti, R., Bagya, M. 2014. Formalin content in meatballs and tofu after several boiling variations. *Health Science and Technology Article*. Vol 1(2): 169-179.
- Putra, I. (2021). Identification of Formalin and Borax in Meatball Products in Banyuwangi District. *Journal of Food Technology and Agricultural Sciences* <https://doi.org/10.36526/jipang.v2i1.1213> (Jipang), 2(1), 21-31
- Regulation No. 33 of 2012 issued by the Republic of Indonesia's Health Minister. Food Additives. July 12, 2012. Jakarta: Directorate General
- Ratnawati, F. 2017. Food Additives. Textbook. Faculty of Engineering, Makassa State University

- Sajiman, S., Nurhamidi, N., and Mahpolah, M. 2015. Assessment of Hazardous Ingredients Formalin, Borax, Rhodhamin B and Methalyn Yellow in School Children Snacks in Banjarbaru. Health Scale Article vol 6 (1).
- Saputro, R. F. (2020). Qualitative Analysis of Formalin in Meatballs in sukrame wayhalim and suka bumi KOVALEN: journal of chemical research 6(3), 218-223 ISSN: 15333.
- Seran, M. N. (2021). Detection of Formalin and Borax Content in Meat Meatballs Sold in Kefamenanu City. Journal of Animal Science, 6(3):52-55 ISSN: 2502 1869.
- Sari, A. N., Sabilla, F., and Sarah, U. M. 2022 examined the formalin content of Banda aceh Proceedings of the National Seminar on Biotics 2022, Volume 10, Issue 2 October 2022 P- ISSN: 97602604 E- ISSN:2828-1675
- Tiven, N.C., and Veerman, M. 2011, Effect of Using Different Saponifying Ingredients on Chemical Composition, Physical and Organoleptic Properties of Chicken Meatballs, Agrinimal Journal
- Tiven, N.C., 2020, Effect of Different Chewy Ingredients on Chemical Composition, Physical and Organoleptic Properties of Chicken Meatballs, Agrinimal Journal
- Winarno F. G. 2012. Food Chemistry and Nutrition. Jakarta: PT Gramedia Pustaka Utama
- Sajiman, S., Nurhamidi, N., and Mahpolah, M. 2015. Assessment of Hazardous Ingredients Formalin, Borax, Rhodhamin B and Methalyn Yellow in School Children Snacks in Banjarbaru. Health Scale Article vol 6 (1).
- Yulianti, s, (2011) Semaraknya formalin abuse in food www.Ditjenak.

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Go. Id, accessed november 18, 2011.

Yulianti, C. H. (2021). A comparison between the Rapid Formalin Test Kit (Labstest) and the Antilin Reagent for the Formalin Detection Test in Food Science and Pharmacy Journal