JOURNAL OF NATURAL SCIENCE AND LEARNING

p-ISSN 2963-1041, e-ISSN 2962-9837
Vol 3. No.2. 2024, pp. 25-31
Availble online
https://journalng.uwks.ac.id/index.php/jnsl

Effect Type Of Packaging Material And Storage Time On Total Plate Count (Tpc) Microbes On Shrimp Paste Chili Sauce

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ABSTRACT

This study aims to determine the effect of type of packaging material and length of storage on microbial Total Plate Numbers in chili paste, a two factorial Completely Randomized Design (CRD) was used in this study. The first factor is the type of packaging material consisting of plastic bottles (A1) and glass bottles (A2). The second factor was the length of storage consisting of 5 days (H1), 10 days (H2) and 15 days (H3). From these two factors, 6 treatment combinations were obtained, and each treatment combination was repeated 4 times, making a total of 24 samples. The results of the study were analyzed using variance analysis at a real level of 5%, if significantly different then continued with the Duncan test. The results showed that the type of packaging and length of storage had a significantly different effect on the parameters of total microbial plate numbers in chili paste ($p<0.05$). Based on the results of the study, it is known that the use of glass bottle packaging (A2) has a better ability to maintain the quality of chili paste. Referring to the SNI standard (01 - 7388 - 2009), the best storage time for chili paste is 10 days (H2), with an average total microbial plate number that is still within the normal range of 4.0 x 104 CFU/g < 1 x 105 CFU/g. In addition, the use of glass bottle packaging material is able to maintain the quality of chili paste better than plastic bottles and the best storage time for chili paste is 10 days.

Keywords: Total Plate Count; Microbes; Paste Chili Sauce; Shrimp; Packaging Material

ABSTRAK

Penelitian ini bertujuan untuk mengetahui pengaruh jenis bahan kemasan dan lama penyimpanan terhadap Angka Lempeng Total mikroba pada sambal terasi, Rancangan Acak Lengkap (RAL) dua faktorial digunakan dalam penelitian ini. Faktor pertama adalah jenis bahan pengemas yang terdiri dari botol plastik (A1) dan botol kaca (A2). Faktor kedua adalah lama penyimpanan yang terdiri dari 5 hari (H1), 10 hari (H2) dan 15 hari (H3). Dari kedua faktor tersebut diperoleh 6 kombinasi perlakuan, dan setiap kombinasi perlakuan diulang sebanyak 4 kali, sehingga totalnya adalah 24 sampel. Hasil penelitian dianalisis dengan menggunakan sidik ragam pada taraf nyata 5%, apabila berbeda nyata maka dilanjutkan dengan uji Duncan. Hasil penelitian menunjukkan bahwa jenis kemasan dan lama penyimpanan memberikan pengaruh yang berbeda nyata terhadap parameter angka lempeng total mikroba pada sambal terasi ($p<0,05$). Berdasarkan hasil penelitian diketahui bahwa penggunaan kemasan botol kaca (A2) memiliki kemampuan yang lebih baik dalam mempertahankan kualitas sambal terasi. Mengacu pada standar SNI (01 - 7388 - 2009), waktu penyimpanan sambal terasi yang paling baik adalah 10 hari (H2), dengan rata-rata angka lempeng total mikroba yang masih dalam kisaran normal yaitu 4,0 x 104 CFU/g < 1 x 105 CFU/g. Selain itu, penggunaan bahan kemasan botol kaca mampu mempertahankan kualitas sambal terasi lebih baik dibandingkan dengan botol plastik dan waktu penyimpanan terbaik untuk sambal terasi adalah 10 hari.

Kata kunci: Angka Lempeng Total; Mikroba; Sambal Terasi; Udang; Bahan Pengemas

Artikel history:20-09-2024. Received in revised from:29-09-2024. Accepted:30-09-2024. Available online:30-09-2024. Ver: pre press

JOURNAL OF NATURAL SCIENCE AND LEARNING
p-ISSN 2963-1041, e-ISSN 2962-9837
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I. INTRODUCTION

Today's modern life causes habitual patterns to change, traditional habits began leaving because they are considered impractical. This can also be seen from food consumption habits that also change. In general, food consumed is the result of processing directly from natural ingredients but at this time this habit begins to change with the use of food processed products can be served quickly, but safe and nutritious.

One the of processed food products is chili sauce, it is made from the basic ingredients of chili which is usually added with other ingredients such as salt, onion, and garlic, sambal also has different flavors according to the level of spiciness. Based on the Indonesian National Standard (SNI) No. 01-2976 In 2006, chili sauce was a sauce obtained from the main ingredient of chili (*Capsicum Sp*), both processed for cooking spices , or additional food ingredients needed. In Indonesia, various types of chili sauce have a unique taste, one of them is shrimp paste chili sauce. In general, there are two types of paste chili sauce in Indonesia based on the ingredients for making shrimp paste, namely shrimp paste sauce and fish paste sauce.

Ease of finding, the easy and practical consumption causes interest of consumers to shrimp paste chili sauce increase, so that food industries to start producing shrimp paste chili sauce. Given the nature of vegetables and fruits that are easily decayed and damaged, it is necessary to try several ways to extend the shelf life so that they can be consumed for a long time. According to Winarno (1987), food damage can be caused by two things, namely damage by the nature of the product that takes place spontaneously the second is damage due to environmental influences. Therefore, food products needed to have the right type of packaging to limit food with the environment in order to prevent or delay the process of damage, so that shrimp paste chili sauce has a long durability for consumption, the selection of suitable storage materials can extend the life of food ingredients (Mangaraj et al, 2009).

The use of types of packaging materials can increase consumer appeal of food products, according to Syarief et al (1993) to attract consumers' attention, food products can be packaged in plastic bags, plastic cups /glasses, or glass bottles by giving important labels as well as information about the product, and can extend the length of time the product is stored in a certain period of time. The length of time storing some food products can be seen from the Total Plate Count (TPC) of microbes found in processed food products, a good processed food products have microbial Total Plate Count (TPC) below the specified limit (Frazier et al. 1998). This can be used as a material consideration to guarantee consumers receive a good quality shrimp paste chili sauce and provide opportunities for the food industry. Based on the description, this is what prompted the author to research the effect type of packaging material and the storage time on microbial Total Plate Count (TPC) on shrimp paste chili sauce.

II. METHODS

This study was an experimental study using factorial Completely Randomized Design with two factors. The first factor is the type of packaging material consisting of 2 types, namely plastic bottle packaging (A1) and glass bottles (A2). The second factor is the length of storage time consisting of 5 days (H1), 10 days (H2) and 15 days (H3), of the two factors obtained 6 combinations of treatments. According to Hanafiah (2009), the determination of the number of replications uses a formula like the following:

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$$(t-1)\,(r-1) \geq 15$$

Information:
t = Treatment
r = Replication

Based on the above formula, the treatment in this study was repeated 4 times each, so the total sample total was 24 samples

This study consisted of two stages, namely the production of shrimp paste sauce and packaging of shrimp paste sauce in plastic bottles (A1) and glass bottles (A2) with a storage time of 5 days (H1), 10 days (H2) and 15 days (H3). In the process of making shrimp paste sauce, the ingredients used are red chili, red onion, garlic, tomato, shrimp paste, salt, and sugar. Making shrimp paste chili sauce starts with frying all ingredients until half done (except shrimp paste which is burned), smoothing all ingredients using a blender, heating the pan with a little oil, then entering the ingredients that have been mashed, the ingredients are then cooked until smell fragrant (± 2-3 minutes), then lifted and cooled. In the packaging process, shrimp paste chili sauce is weighed in advance of 300 g then packaged using a plastic bottle (A1) and glass bottles (A2) which are already available with a storage time of 5 days (H1), 10 days (H2) and 15 days (H3). Next is the calculation (TPC) of microbial Total Plate Count found in shrimp paste sauce with different types of packaging and storage time.

Data from the study of the effect of the type of packaging material and the length of storage on Microbial Total plate Count (TPC) on shrimp paste chili paste were analyzed using variance at 5% real level, if the data were significantly different then continued with the Duncan test.

III. RESULTS AND DISCUSSION

3.1 *Type of packaging material*

Terasi is a fermented product that will continue to will continue to be broken down by microorganisms (Isdaryanti *et al*, 2023).The effect of the type of packaging and storage time on the average value of TPC (Total Plate Count) on shrimp paste sauce is taken in the following Table 1.

Table 1 Average Yield Of TPC Analysis nn Shrimp Paste Chili Sauce.

Type of Packaging Material	Storage Time on		
	5 Day (H1) (CFU/g)	10 Day (H2) (CFU/g)	15 Day (H3) (CFU/g)
Plastic bottles (A1)	$2,3 \times 10^4$	$5,7 \times 10^5$	$1,2 \times 10^6$
Glass bottles (A2)	$1,6 \times 10^4$	$4,0 \times 10^4$	$5,6 \times 10^5$

The results of the analysis in table 1 show the value of microbial TPC (Total Plate Count) has a positive relationship with the type of packaging material and storage time. The type of plastic bottle packaging material with a storage time of 5 days (H1) shows the value of microbial TPC (Total Plate Count) in a shrimp paste, chili sauce of 2.3 x 104 CFU / g, while for type of glass bottle packaging with the same storage time shows TPC value (Total Plate Count) microbes at 1.6 x 104 CFU / g. On the 10th day (H2) the value of TPC (Total Plate Count) microbial shrimp paste chili sauce, which is packed with plastic bottle (A1) packaging material amounting to 5.7 x 105 CFU / g and for shrimp paste chili sauce packaged with the type of bottle packaging material glass (A2) shows the value of microbial TPC (Total Plate Count) of 5.7 x 105 CFU / g. The type of plastic bottle packaging (A1) on 15 days (H3) shows the value of microbial TPC (Total Plate Count) on the shrimp paste chili sauce of 1.2 x 106 CFU / g microbial whereas for glass bottle packaging (A2) with a long storage time the same is 15 days (H3) showing the value of microbial TPC (Total Plate Count) of 5.6 x 105 CFU / g. Based on the results of analysis of variance showed that the type of packaging

p-ISSN 2963-1041, e-ISSN 2962-9837
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https://journalng.uwks.ac.id/index.php/jnsl
JOURNAL OF NATURAL SCIENCE AND LEARNING

material and storage time gave a significant difference with the significance level of 5% (P <0.05) on value of microbial TPC (Total Plate Count) on shrimp chili paste sauce.

Based on table 1, it can be seen that there is an interaction between the type of packaging material and the value of microbial TPC (Total Plate Count) on shrimp paste sauce. According to Anwar et al (2011) the types of food packaging materials that are good have several conditions, which do not contain hazardous ingredients, must not dissolve into food ingredients, colors of food packaging must use dyes that do not easily wear off, food packaging must be easy to use packaging must not interfere with natural odors from packaged food, packaging must be easily sanitized before being used for packaging, and packaging must be strong in accordance with the type of food being packaged. The selection of good packaging with a selective system of packaging materials that are in accordance with the product to be packaged can extend shelf life through controlled storage (Mangaraj et al.2009). This is also reinforced by the opinion of Hariyadi (2008) which states that the type of packaging is an important factor in an effort to minimize or control the process of decreasing the quality of a food product. Packaging has a very important role in protecting packaged products, therefore the selection of the right packaging material and a good packaging process is very important to protect the product from the factors that cause damage to the packaged product.

The results showed that average results of the analysis of value of microbial TPC (Total Plate Count) on shrimp paste sauce packed with glass bottles (A2) were lower than those packed with plastic bottles. This can be caused by the superiority of the glass packaging (A2) properties compared to plastic packaging (A1). Glass packaging has properties that are more impermeable and not porous than plastic packaging so that glass packaging is a good barrier to water vapor, water, gas and so on (Sucipto et al, 2017). This is also supported by the results of a study conducted by Esteria (2008) which states that soy milk stored using plastic bottles has more total bacteria than soy milk stored using glass bottles. According to Fardiaz (1993) there are several factors that cause an increase in the number of TPC on raw food ingredients and processed food ingredients, among others, contamination of airborne mold spores and nutrient content in food ingredients which is a medium for the growth and development of microorganisms. According to Wasteson *et al.* (2009) microorganisms need nutrients for growth and development, components that are nutrients for microbes include carbohydrates, proteins, lipids, minerals and vitamins. Contamination of microorganisms on food ingredients is a result of microbiological damage. The causes of microbiological damage are various microorganisms such as yeast, mold and bacteria (Nurmaini, 2001). Microbiological damage is very detrimental and sometimes or even often poses a danger to health because of the toxins it produces. Materials that have been damaged by microbes can be a source of contamination that is harmful to other ingredients that are still fresh.

1.1 Duration of Storage

The length of storage time is time needed by food products under certain storage conditions to be able to reach a certain level of quality degradation (Floros, 1993). According to Rahayu et al. (2003), there are seven types of food products that are not obliged to include a time limit for food stored and consumed, namely: 1) fresh fruit and vegetables, including unpeeled potatoes, 2) drinks containing greater alcohol or equal to 10% 3) food produced for consumption at that time or not more than 24 hours after production, 4) vinegar, 5) table salt, 6) granulated sugar, and 7) similar items whose raw materials are only sugar plus flavor or coloring sugar. Based on these regulations, all food products including shrimp paste chili sauce must include the feasibility time these food products to be stored and consumed.

Based on table 1, it can be seen that the results

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of the TPC (Total Plate Count) analysis on shrimp paste sauce indicate that addition of a microbial amount along with the length of storage time or in other words breeding and the addition of microbial numbers are directly proportional to the length of storage time. This is because microbes need time to divide or multiply, which is called generation time. The time needed by microbes to divide themselves varies greatly depending on environmental conditions. Most microbes have a generation time of 1-3 hours (Radji, 2011). Theoretically, the microbial growth cycle is grouped into four phases, namely the lag phase, log phase, stationary phase and death phase (Radji, 2011). Phase lag is the phase of adjustment to the new environment. This phase is the initial phase of microbial growth when microbes are still small in number and have not experienced cleavage in new media. The lag phase can last for 1 hour or several days depending on microbial species that grow as well as environmental conditions (Radji, 2011). Furthermore, microbes will experience a log phase. Cells begin to divide and experience cell expansion exponentially. Microbes synthesize new materials constantly, but new materials catalyze themselves and the mass increase exponentially. This continues until nutrients are exhausted or toxic metabolic accumulations occur, thus inhibiting growth (Brooks, 2005). After passing through the log phase, the microbes will experience a stationary phase. The number of microbial populations in composite flour wet noodles reached the peak. Some microbial populations survived in the stationary phase only within a few hours, or even several days (Nester, 2012). The last stage, the microbes will experience a phase of death. The rate of cell death occurs faster than the rate of growth of new cells, a small amount of microbes that are still growing will use nutrients released by dead and lysed cells. This phase will continue until the microbial population shrinks or dies overall. Furthermore, food products will experience decay (Nester, 2012)..

Calculation of the number of microbes in this study using the TPC (Total Plate Count) method if the value of TPC (Total Plate Count) is high then the quality of food microbiology is considered low because the high value of TPC (Total Plate Count) on food indicates a large number of microorganisms, which can endanger consumers . Referring to the SNI standard (01 - 7388 - 2009), the best storage time for shrimp paste sauce is for 10 days (H2), with an average microbial Total Plate Count that is still within the normal limit of 4.0x 104CFU / g < 1 x 105 CFU / g. According to Koswara (2004) the duration of storage of food products can be known from microbiological observations, namely counting the number of microbial colonies in food products and physical observations because it is quite easy to know the safe limits of food storage time, texture changes and product organoleptic deviations are indicative from products that are not suitable for consumption or have exceeded the time limit for storing the product. The side effects suffered by consumers due to consuming stored food in excess of their storage time is poisoning. Common symptoms of poisoning are abdominal pain, nausea, vomiting, dehydration, diarrhea, dizziness and fainting. The symptoms of poisoning can be classified into several other a) Mild poisoning, ie if the symptoms of poisoning only feel stomach ache, nausea, vomiting, and itching in the body b) moderate poisoning, that is, if the symptoms of poisoning are sufferers feeling abdominal pain accompanied diarrhea, and sometimes dizziness and vomiting, fever and the appearance of red spots on the body, so that conditions like this are classified as moderate poisoning c) severe poisoning, which is when the symptoms of poisoning are patients severe abdominal pain accompanied by irresistible diarrhea, vomiting, pain head, fainting and the appearance of reddish spots accompanied by itching throughout the body (Mutiati, 2003).

IV. CONCLUSION

Processed food products of shrimp paste sauce can be stored for a longer time using the

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https://journalng.uwks.ac.id/index.php/jnsl
JOURNAL OF NATURAL SCIENCE AND LEARNING

type of glass packaging material and product storage time is 10 days because at that time the number of microbes in shrimp paste sauce is below the normal limit of 4.0x 104CFU / g < 1 x 105 CFU / g.

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Vol 3. No.2. 2024, pp. 25-31
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