

Total Plate Count (TPC) Analysis of Processed Ginger on Tlogowungu Tourism Village

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Abstract— The various natural resources of Tlogowungu Village has becomes the income for the citizens. Of the natural resources, gingers are known to be beneficial to health. Gingers are rich in antioxidant content as health benefits, so that Tlogowungu residents utilize ginger into various preparations such as *instant ginger, instant bandrek, ginger enting-enting, ginger candy and ginger syrup*. On this study, microbiological quality analysis has done by total plate count method to know whether the product has been in accordance with the standard or not. Total Plate Count (TPC) is a method of estimating the total number of microorganisms (mold, yeast, bacteria) in a material. The research begins with dilution phase of the sample until it reaches 10^{-5} dilution. Microbial total analysis was done by taking each 1 ml of dilution sample and inserted into 15-20 ml petri dish. The sample in the petri dish is lifted to freeze. The final stage is incubation by inserting a petri dish in an upside position into the incubator. Incubation is carried out at 36°C for 24-48 hours. Last done calculation and recording colony growth. Based on total microbial analysis, *Bandrek Instant* and *Jahe Instant* have the total value of microbe in accordance with the standard set by Standar Nasional Indonesia (SNI). While on the product of *ginger enting-enting, ginger candy and ginger syrup* have the total microbial value is not in accordance with the standards set by Standar Nasional Indonesia(SNI).

Keywords—*ginger, tpc method, ginger processed*

I. INTRODUCTION

Indonesia is one of countries with the most ginger production in the world. Indonesia has three varieties of ginger, there are gajah ginger, emprit ginger and red ginger. The produced ginger will be exported, however in a few years Indonesia has decreased of export amount because have to compete with other ginger producing countries. So the sale value of ginger will decrease. For increasing ginger sale value then made various kinds of ginger, because ginger contains are good for health. Other than as a giver flavor in various food, ginger is also known to have benefits for cure the disease, such as upset stomach, cough and diarrhea.[1], [2] According to previous research, ginger has an antioxidant compounds.[3] The result research showed that non volatile phenolic as active compounds such as gingerol,

shogaol and zingeron, which is found in ginger has proven to be an antioxidant. Gingerol and shogaol has proven to be primary antioxidant for lipid radical. Gingerol and shogaol have antioxidant activity because they are containing of benzene ring and hydroxyl group.[4]

In Tlogowungu Village ginger is used into instant ginger and ginger. Instant ginger is made from several ingredients: ginger, sugar and pandanus. While ginger syrup is made from gajah ginger, emprit ginger, honey, sugar, temulawak, clove, pandanus and mineral water. Instead of the composition, ginger syrup can be classified as a healthy drinks because there are several bioactive components in added herbs. The addition of various herbs in this product is only based on traditional recipes without knowing the health benefit of the bioactive components in each herbs. By knowing the benefits of herbs for health so it can be a promotion for ginger products then to increase the product sales and impacted for increasing Tlogowungu citizen welfare. Other ginger products are instant badrek, ginger enting-enting and ginger candy.

There are several things that used as quality parameters of ginger products such as the total value of microbes to determine food safety from produced product. For parameter that determine other qualities, it can also known from the ability to counteract free radical and maintain immunity that be avowed of antioxidant activity.

This study aims to give food safety and product quality information of ginger product that produced Tlogowungu village so this research can be used as reference for knowing the ginger product quality in Tlogowungu Village

II. RESEARCH METHODOLOGY

In this study microbiological quality analysis was carried out using *total plate count* method. *Total Plate Count* (TPC) is a method of estimating the total microorganism number (mold, yeast, bacteria) in an ingredient. TPC analysis uses *Plate Count Agar (PCA)* as media by planting one gram of diluted sample into petri dish, then incubated. TPC calculation result as colonies (cfu)/ml. This research was carried out at the Food and Nutrition Microbiology

Laboratory, Muhammadiyah University, Semarang. Materials used include: samples of ginger products (instant ginger, instant bandrek, ginger enting-enting, ginger candy and ginger syrup), aquades, Plate Count Agar (PCA), 85% NaCl and cotton. The tools used include: test tubes, stomacher, petri dish, erlenmeyer, micropipette, bunsen, incubator, autoclave, refrigerator, analytic scales, spatulas and stirring rod. The stages begin from tools sterilization using autoclave with a temperature of 121°C for 45 minutes. In the homogenization stage, 5 grams of ginger product sample is mashed using a stomacher (for ginger enting-enting and ginger candy) then added to 85% as much as 45 ml. In this stage obtained 10^{-1} dilution, then the dilution stage was carried out as much as 10^{-5} by providing a test tube 9 ml containing of 85% NaCl. Then fill the tube by taking 10^{-1} dilution sample as much as 1 ml to get a sample suspension tube with 10^{-2} . From 10^{-2} tube 0.1 ml was taken to be inserted into the next tube until a sample suspension is obtained with 10^{-5} dilution. Then PCA media was poured into 15-20 ml. After the PCA is frozen, 0.1 ml of dilution sample is taken into a petri dish and leveled with a stirring rod. The final stage is incubation by inserting all petri dishes in the upside position into the incubator. Incubation is carried out at 37°C for 24-48 hours. Calculation and recording of colony growth is carried out in colony forming unit per ml (cfu/ ml) or per gram (cfu/ml).[5]

Total microbial analysis was carried out by taking 1 ml of each dilution sample and put it in a sterile petri dish. Then poured liquid PCA media into the petri dish as much as 15-20 ml. Petri dishes are carefully rotated and moved horizontally or parallel (or form an eight) until the sample is evenly mixed. At the same time a blank check is also carried out by mixing the buffer into the media. The mixture in the next petri dish is allowed to freeze. The final stage is incubation by inserting all petri dishes upside down into the incubator. Incubation was carried out at 36 ± 1 °C for 24-48 hours. Calculation and recording of colony growth is carried out in colony units forming units per gram or ml of sample (cfu / gr or ml)[6]

III. RESULT AND DISCUSSION

Based on the analysis that has been done, it is obtained the microbial value of some ginger products shown in table 1 below:

TABLE 1.

No	Total Microbial Value in Various Ginger Products		
	Product	Result (cfu/ml)	SNI (cfu/ml)
1.	Instant Ginger	$1,1 \times 10^3$	3×10^3
2.	Instant Bandrek	$2,5 \times 10^3$	3×10^3
3.	Ginger Candy	$5,2 \times 10^3$	5×10^2
4.	Ginger Enting-enting	$1,9 \times 10^3$	5×10^2
5.	Ginger Syrup	1×10^3	5×10^2

A. Instant Ginger

The result of microbiological quality analysis of instant ginger product showed the total microbial value of 1.1×10^3 cfu / ml. The total amount of instant ginger microbes based on BPOM and SNI still match the standard. The total microbial standard set is 3×10^3 , so it can be concluded that instant ginger product is safe for consumption. Antioxidant testing with the binding method of DPPH (1,1-diphenyl-2-picryl hydrazyl) radical with a wavelength of 516 nm obtained data that instant ginger has the highest antioxidant levels when compared to other ginger products (41.632%). Antioxidants in instant ginger include the category of powerful antioxidants. Based on Phongpaichit, which states that a compound is declared anti-free radicals is very strong if it has an IC_{50} value $< 10 \mu\text{g} / \text{mL}$, strong if the IC_{50} value is between $10-50 \mu\text{g} / \text{mL}$, medium category if the IC_{50} value ranges from $50- 100 \mu\text{g} / \text{mL}$, the category is weak if the IC_{50} value ranges from $100-250 \mu\text{g} / \text{mL}$ and the category is inactive if the IC_{50} is above $250 \mu\text{g} / \text{mL}$. [7]

B. Instant Bandrek

The result of microbiological quality analysis of instant bandrek product showed the total microbial value of 2.5×10^3 cfu / ml. These results is match with the standard set by the Indonesian National Standard (SNI) which is $< 3 \times 10^3$ cfu / g. Microbial growth means the increases volume (large) of each microbial individual. Microbial growth means the increases volume (large) of each microbial individual. Microbial growth is influenced by several factors, such as temperature, water content and A_w . A_w is the amount of free water needed by microorganisms to grow and multiply the amount.[8], [9] Instant bandrek is processed with drying principle or decreasing water content, so the microbial growth in this product can be suppressed. In this test the incubation was carried out at 37 °C for 24-48 hours. High temperature incubation ($35-37$ °C) and short incubation time (34-48 hours) support bacterial growth.[10] Thus, it can be concluded that the temperature and time used in this test are match with several references.

C. Ginger Candy

Based on the results of the analysis it is known that the total yield of ginger candy microbes is 5.2×10^3 cfu/ml. The total number of microbe has not match the standard of SNI for soft candy instead of jelly which is 5×10^2 cfu/ml.[11] It can be concluded that the ginger candy product has not fulfilled the standard. The discrepancy between the test result and the standard is presumably because there is still a considerable amount of water in product, moistly storage temperature cause bacteria to grow up easily and the total bacteria in the product obtained during processing and raw materials such as water and sugar and contamination from the environment.[12],[13] Microbial proliferation in addition to requiring appropriate environmental conditions, availability of nutrients also requires temperature, humidity, oxygen, pH and light. pH that is too alkaline will accelerate microbial growth. To reduce the pH of processed food products, preservatives such as citric acid are given. In making this ginger jelly candy do not use preservatives.

High water levels cause food security and faster microbial growth. According to previous research, the high water content produced by jelly candy is due to the fact that the substance in the processed material contains too much water or dissolved solids that are too low so that the consistency is not very strong.[14] Too little consistency of the gel causes the tissue to not hold the sugar liquid, causing the candy to undergo syneresis and produce high water content. Water content greatly affects the quality of food so that in processing, the water is often released or reduced by evaporation and drying. In addition to this, an increase in the number of microbes is also caused by the water source used.

D. Ginger Syrup

The result of the TPC test showed that the number of bacteria in ginger honey syrup with storage time for 2 months contained 1×10^3 cfu/ml of bacteria with a limit of SNI 7388:2009 5×10^2 cfu/ml with a temperature of 30°C and an incubation of 72 hours. So it can be concluded that the number of bacterial colonies found in ginger honey syrup is not match with the criteria of SNI 7388: 2009 and is not suitable for consumption. The production process that still uses simple tools, knowledge of poor hygiene, and cleanliness is still very limited, and there is no standardized production management system to make ginger syrup preparations vulnerable to security risks. Intentional or accidental food contamination during food production can endanger the health of consumers, and has a very expensive impact.[15]

IV. CONCLUSION

The storage temperature of food products can affect the increase in water activity and redox potential. The activity of water from food rises if the food products are stored in a humid room. The development of oxidative microorganisms can occur when the surface of food is related to air. The growth of anaerobic microorganisms or facultative anaerobes can occur, if the packaging of food products is carried out vacuum. Temperature is an important factor in the growth rate of microorganisms. Changes in food quality due to the growth of microorganisms can endanger human health. Food products that can cause injury or death are said to be unsafe food products.

Instant ginger and instant bandrek products are microbiologically safe to consume because they have a total value of microbes that are in accordance with SNI standard. Enting-enting, ginger candy and ginger syrup have a total microbial value that exceeds the SNI standard so it is not safe for consumption.

V. ACKNOWLEDGEMENT

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VI. DISCLOSURE

The writers claim that there is no conflict of interest in this study.

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