The Comparation Study of Pasteurized "Fruits Up" Products Using TPC (Total Plate Count) Method

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Abstract

Fruits Up is one of the small and medium sized enterprises (SMEs) which is engaged in developing puree mango beverage. To satisfy the consumer, Fruits Up decided not to use chemical preservatives as a solution to be a healthy drink with longer shelf life time product. The purpose of this research is to conduct pasteurization process on Fruits Up product as solution of increasing product shelf life time without the use of chemical preservatives. Comparison of existing products will be analyzed using microbiological quantitative analysis with Total Plate Count (TPC) method and presented in the form of Standard Plate Count (SPC). The sampling method was using a Completely Randomized Factorial Design with difference room temperature and storage time (1 day, 3 day and 5 day). According to the result, the least amount of bacteriology is present in the pasteurized Fruits Up product with H1 storage of refrigerator temperature (10°C) and the highest amount is found on Fruits Up products that have not been pasteurized with H5 storage of room temperature (26°C). Based on the results, a significant decrease in TPC occurs during the pasteurization process so that the pasteurization process is highly recommended to be performed permanently.

Keywords: *Fruits Up; Mango Puree; Pasteurization; SMEs; TPC*

1. INTRODUCTION

According to the Center for Agricultural Data and Information Systems, mango is an important foodstuff after bananas for people in tropical climates and high economic value. The priority of commodities that have been determined by the Ministry of Agriculture of the Republic of Indonesia in the development of horticultural agribusiness to be studied and developed is mango (Broto, 2003). Processing mango into puree is an alternative to increase the economic value of mango (Sukasih et al., 2005). One of the puree mango products is "Fruits Up" which became the object of this research.

Fruits Up decided not to use chemical preservatives as a solution to be a healthy drink with longer shelf life time product. However, the existence of a product that is rejected by the distributor or agent because of a defective product when it arrives at the destination becomes a challenge to improve product quality. Allegedly, the damage caused by the process of product distribution and storage that are not appropriate so that the bacteria can easily breed in the product.

Optimal temperature for bacterial proliferation is 30°C-40°C and often occurs during the product distribution so that the possibility of product damage is very large (Suriani, 2013). The presence of heating the product has many benefits and not only reduces the nutritional value (Tjahjadi and Marta, 2011), which can kill pathogenic bacteria, extend shelf life by turning off bacteria decay, disabling enzymes in acidic foods such as juice, provides better flavor and enables phosphatase and catalase enzymes (Dyah, 2017).

The heating that given to food can not be generalized, data of curve TDT (thermal death time) is required to know the heat resistance of mango puree. To achieve heat sufficiency value, pasteurization of mango puree should be done with a combination of temperature 90°C for 12.46 minutes (Sukasih et al., 2005). Therefore, a study was conducted to compare the number of bacterial colonies in products that have been pasteurized and those that did not. The way to detect the amount of bacteria present in a food product is by TPC (Total Plate Count) test by counting bacterial colonies grown on agar medium (Waluyo, 2016).

Products can be categorized as safe if the total number of bacterial colonies (Total Plate Count/TPC) is no more than 1x104 colony forming unit /gram (CFU/g) (SNI, 2009).

2. MATERIALS AND METHODS

This research was conducted in Food Microbiology Laboratory Faculty of Agroindustrial Technology, Padjadjaran University, Jatinangor, West Java. This research used Completely Randomized Factorial Design with difference room temperature and storage time (1, 3 and 5 days). Data collection using the principle of Standard Plate Count (SPC) method. Microbes that grow in the media will form into bacterial colonies that can be seen directly with the naked eye.

2.1 Preparation

Preparation of the material carried out is pasteurization on 6 fruits up products at 90°C for 12.46 minutes refers to research from Sukasih in 2005 on Heat Adequacy Analysis of Mango Puree Pasteurization Process. Fruits Up product that has been pasteurized then packed back in the bottle. Preparation of other ingredients is to take samples of unprocessed puree mango to be used as the initial control of bacterial count and take 6 Fruits Up products that have been processed in such a way by PT. Ormund Indonesia. Fruits Up product used in this research is Gedong Gincu variant.

2.2 Total Plate Count

Data analysis was performed using the Total Plate Count method according to SNI 2897: 2008. This method is the most sensitive method to determine the number of microorganisms. With this method, we can calculate living cells and compare the results according to national standardization of total bacterial colonies that are classified as safe for consumption. The working principle of TPC analysis is the calculation of the number of bacterial colonies present in the sample with dilution as needed and duplo is done to improve the accuracy. The number of bacterial colonies that can be calculated is a petri dish that has a bacterial colony between 30-300 colonies.

The sample dilution process uses a BPW (Buffered Peptone Water) solution until the sample concentration becomes 10^{-1} up to 10^{-5} dilution, the procedure of the sample dilution process is:

1. Samples or cultures of microbes that have been mixed with BPW solution which is stored sterile reaction tube then in puree until liquid and can be sucked using micropipet at dilution 10^{-1}
2. Then after diluted, take 1 ml of the dilution sample with micropipette and pour into a reaction tube containing 9 ml of aquadest (dilution 10^{-2}) do the same treatment to (dilution 10^{-3}, 10^{-4}, 10^{-5})

This stratified dilution aims to minimize the amount of microbes suspended in the fluid, and the magnitude or amount of dilution rate depends on the approximate number of microbes in the sample. The first dilution and so on used a 1:9 ratio so that the next sample contained 1/10 microorganism cells from the previous dilution (Wasteson and Hornes, 1991).

2.2 Data Analysis

The data analysis is to describe the result of Total Plate Count obtained on the Fruits Up sample and present it in table form to facilitate the reading. The analysis presented in table form is a method of Standards Plate Counts (SPC) which releases microbial results with a distance of 30-300 CFU (Colony Forming Unit)/g of $10^{-2,}$ 10^{-3}, 10^{-4}, 10^{-5} dilution. The purpose of this SPC method is to minimize the possibility of error in the analysis process. This colony range is used as a fulcrum in determining the effect of the final result which will be adjusted to the maximum limit of microbial contamination in food as in SNI 7388: 2009.

2. RESULTS

Based on the research data obtained the number of TPC microbes in Fruits Up beverage samples ranged from 1×10^2 - 1×10^7 CFU (Colony Forming Unit)/g, the TPC results obtained then analyzed based on SPC (Standard Plate Count) (Table 2).

Table 2. Total Plate Number

No	Sample Code	Analysis Results	Results Unit	Testing Method
	Total Plate Number			
1	A (*Puree* Mango) H1	$2{,}1 \times 10^4$	CFU/g	SNI 2897: 2008
2	B (Fruits Up, room temperature storage 26°C) H1	$2{,}4 \times 10^4$		
3	B (Fruits Up, room temperature storage 26°C) H3	$2{,}6 \times 10^6$		
4	B (Fruits Up, room temperature storage 26°C) H5	$3{,}1 \times 10^7$		
5	C (Fruits Up, refrigerator storage 10°C) H1	$4{,}3 \times 10^4$		
6	C (Fruits Up, refrigerator storage 10°C) H3	$9{,}9 \times 10^5$		
7	C (Fruits Up, refrigerator storage 10°C) H5	$1{,}9 \times 10^7$		
8	D (Fruits Up pasteurization, room temperature storage 26°C) H1	$7{,}0 \times 10^3$		
9	D (Fruits Up pasteurization, room temperature storage 26°C) H3	$2{,}4 \times 10^6$		
10	D (Fruits Up pasteurization, room temperature storage 26°C) H5	$1{,}2 \times 10^7$		
11	E (Fruits Up pasteurization, refrigerator storage 10°C) H1	$4{,}4 \times 10^2$	CFU/g	SNI 2897: 2008
12	E (Fruits Up pasteurization, refrigerator storage 10°C) H3	$1{,}2 \times 10^5$		
13	E (Fruits Up pasteurization, refrigerator storage 10°C) H5	$1{,}6 \times 10^6$		

[1] personal documentation source.

The results of the research on microbiology amount obtained based on SPC from 13 samples of Fruits Up ranged from 1×10^2-1×10^7 CFU (Colony Forming Unit)/g. The results of this research test show that there are differences between the products that pass the pasteurization process and not. The sample with the pasteurization process has a much smaller number of microbes compared to samples that are not pasteurized.

Samples that are said to be safe to consume are samples with E code (Fruits Up pasteurization, refrigerator storage 10°C) H1 and samples with code D (Fruits Up pasteurization, room temperature storage 26°C) H1, while samples that do not pass pasteurization have the total plate number (ALT) above the standard maximum limit of microbial contamination in food SNI 7388: 2009. This is very likely to occur because the mango puree sample before being processed into Fruits Up has a microbial number above the Indonesian National Standard which is $\geq 1 \times 10^4$.

CONCLUSIONS

Pasteurization process is highly recommended due to significant decrease in TPC. The number of TPC microbes in Fruits Up beverage samples ranged from 1×10^2 - 1×10^7 CFU (Colony Forming Unit)/g.

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