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Physicochemical And Sensorical Analysis of Canned Bubur Pedas During Storage

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ABSTRACT: *This study investigates changes in the quality of Bubur Pedasin a can during storage by carrying out its physicochemical and sensory analysis. The sterilization process is carried out for 60 minutes with a Fo value of 9,141 minutes. Storage was carried out for 8 weeks at 3 temperature conditions namely 35, 45, and 55 ° C. Storage temperature affects changes in physicochemical and sensory quality of the product. The higher the storage temperature changes in food quality are faster. Based on the results of sensory and physicochemical analysis, critical parameters that have the fastest reaction rate are color, aftertaste and aroma.*
KEYWORDS*: bubur pedas, sensory analysis, shelf life, canned, traditional food*

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I. INTRODUCTION

Indonesia is a country that often experiences natural disasters. From 1815 to 2018 various disasters have occurred in each province with more than 200,000 victims. Natural disasters that killed the most people were earthquakes and tsunamis and volcanic eruptions[1]. Natural disasters not only cause many injuries or injuries but can also cause psychological effects and hunger. Fast and appropriate handling is needed to reduce the negative impact of the disaster. One of the prevention programs is to create emergency food products (EFP). Emergency food is food produced and can be consumed directly to meet daily nutritional needs (2,100 calories) that occur when an emergency[2]. The creation of emergency food must be able to meet the calorie needs of humans in emergencies and have a taste that suits the tastes of the Indonesian population. Until now emergency food has not been found developed from the typical foods of a region.

Bubur Pedas is a traditional food originating from the province of West Kalimantan, especially Sambas Regency. This traditional food is prepared from rice spices mixed with various vegetables, and seasonings. Bubur Pedas has a distinctive shape, taste and aroma, which is dominated by various kinds of vegetables, such as ferns, bean sprouts, long beans, carrots and sweet potatoes. The taste of Bubur Pedas is not spicy as the name suggests. Another uniqueness of Bubur pedas from West Kalimantan is the use of rice flour as the main source of starch. Mixing various ingredients such as roasted rice, various spices and leaves of kesum leaves causes a combination of distinctive flavor and aroma.

In this study, emergency food was made in a tin package that resembled the manufacture of Bubur Pedas, but without mixing various vegetables to avoid overcooking the results of sterilization during sterilization. This study aims to develop alternative food emergency based on traditional food, namely Bubur Pedas from West Kalimantan which is packed with cans and long life.

II. METHODS

2.1 Production of Bubur Pedas without Vegetables

Bubur pedas making refers to the manufacture of spicy porridge/bubur pedas in general but without the addition of vegetables. Roasted rice with skinless peanuts (comparison of rice: groundnuts: water = 3: 1: 10) is boiled, then added with a spice of 43,5% seasoning on the basic formula and 2,5% sliced small kesum leaves. Roasted rice is rice roasted with coconut grated coconut (3: 1) in 60 minutes then milled and filtered using a 20 mesh sieve. Spices ingredients are white pepper 5,6%, black pepper 5,6%, red onion 33,5%, garlic 16,8%, coriander 8,4%, salt 16,8%, galangal 11,2% and turmeric leaves 2,2%, obtained from traditional markets in Bogor, Indonesia . White pepper, black pepper, onion, garlic, coriander and salt are ground until homogeneous and fried using cooking oil. Flaky galangal and thinly sliced turmeric leaves.

2.2 Canning Bubur Pedas without Vegetables

Cans containing bubur pedas in a vacuum and then coated using a double seammer. The tool works by removing cans twice so that the possibility of leaking cans can be minimized. Each canned packed product dimensions 307 x 113 with 200 g bubur pedas weight. The sterilization process was carried out at 121 ° C for 60 minutes using a Korimat retort.

2.3 Analysis of Bubur Pedas Quality

The analysis carried out included: chemical and physical analysis, namely the measurement of pH, viscosity and color with chromameter. Furthermore, sensory product sensory tests were carried out using a flavor profile method. This method is based on the concept that flavor consisting of taste, smell and taste factors due to chemical reactions, coupled with an underlying sensory complex impression, which cannot be identified separately. This method is used to develop a new flavor prototype, determine the standard flavor profile of a product, measure the flavor changes that occur due to storage and packaging. The panel consists of 7 people who are trained to precisely describe the aroma, color, taste and characteristics of mouth feel from the product. Panelists work together in reaching the description agreement used. At the time of evaluation, the product is prepared and presented in exactly the same way as the consumer uses the product. Panelists were trained to know canned products that had been stored at 55 °C for 0, 15 and 30 days. Parameters of aroma, taste, color and viscosity identified, then each intensity is assessed.

III. RESULTS AND DISCUSSION

3.1 Physicochemical Analysis of Bubur Pedas

The quality of Bubur Pedas during storage in cans is analyzed to find out the changes that occur through color test, pH, TBA and viscosity. Observations were carried out for 8 weeks with treatments at different temperatures of 35, 45 and 55°C. The results of the analysis are shown in Figure 1.

3.1.1 Color Analysis

Color parameters are the main indicator of changes in the quality of a sterilization product[3]. The color of the product is influenced by spices. Spices will give the product taste, aroma and color[4]. The color of the product in fresh canned packaging is brownish white, while the color of the product in a broken tin can is dark brown. Figure 1 (1) shows the color change (ΔE) that occurs during storage. The higher the storage temperature, the greater the color change. Storage temperature of 35, 45 and 55 ° C changes color (ΔE) of 1,95, 3,02 and 4,48 respectively until the 8th week. Discoloration occurs due to the Maillard reaction, which is a non-enzymatic browning reaction that occurs between amino acids from proteins and simple sugars from carbohydrates. The end of the Maillard reaction produces melanoidin pigments as brown formers[5] which take place at high temperatures[6].

3.1.2 pH analysis

Bubur Pedas products without vegetables belong to low-acid food (pH 6,05 – 6,15). Low-acid food requires a high-temperature heating treatment process when it can be packaged. According to Syah (2012), food products can be categorized as high-acid food products (pH 3,7), medium-acid food products (pH 4,5) and low-acid food products (pH 5–7). High acid food products are sufficiently heated in boiling water (100 °C) while medium and low acid food products are processed with high heating (115 °C - 121 °C).

Figure 1 (2) shows a decrease in the pH of canned spicy slurry during storage. Decreasing pH in storage products is 55 °C faster than products in storage temperatures of 35 °C and 45 °C. the pH vaue of product stored at 55 °C dropped from 6,14 to 5,81. The products stored at 35 °C and 45 °C dropped from 6,14 to 5,93 and 5,94 respectively. Changes in the level of acidity of the product are caused by fat oxidation caused by residual oxygen in cans and degradation of carbohydrates, especially glucose and degradation of fat components[7,8].

3.1.3 Rancidity Analysis (TBA)

The value of TBA is a measurement of malonaldehyde content, one of the results of the degradation reaction of fatty hydroperoxide products formed during the process of unsaturated fatty acid oxidation[9]. There is an increase in the value of TBA in all storage conditions. Storage temperature affects the increase in rancidity value. Seen in Figure 1 (3), storage temperatures of 45 °C and 55 °C have higher TBA values than storage temperatures of 35 °C. The value of TBA produced is still relatively small when compared to the maximum standard value of TBA for a food that is 0,5 mg malonaldehyde/kg. In addition, until the 8th week canned bubur pedas in all storage conditions can still be accepted based on rancidity.

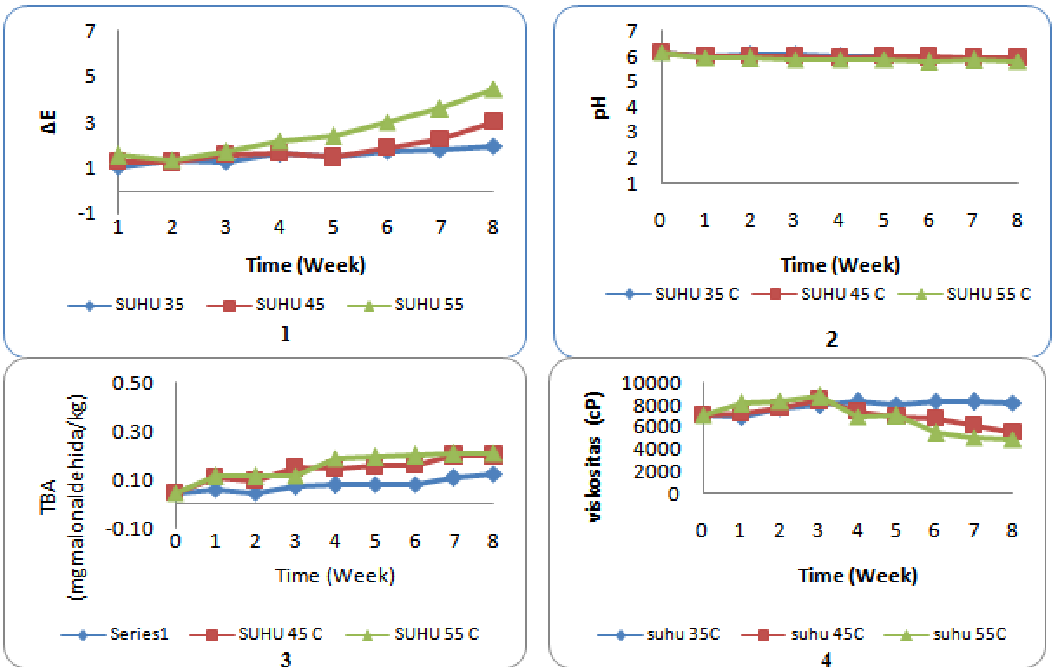

Figure 1. Results of analysis on spicy slurry during storage in cans, (1). Color change (ΔE), (2). Change in pH, (3) rancidity (TBA) and (4) viscosity change (cP)

The rancidity reaction that occurs in slurry products in cans is caused by the oxidation of fat contained in peanuts and palm oil. Palm oil is a source of unsaturated fatty acids, especially oleic and linoleic fatty acids[10]. Peanuts are a source of unsaturated fatty acids[11]. The high content of fatty acids in peanuts makes them easily oxidized causing a decrease in quality when stored at temperatures that are not optimal or stored for a long time[12]. Oxygen remaining in the can during storage will induce fat oxidation, causing rancidity.

3.1.4 Viscosity Analysis

Viscosity describes the amount of internal resistance or friction that affects the ability to flow a liquid to flow and stirring. Figure 1 (4) shows changes in viscosity during storage. During storage there are 2 phases of change in viscosity, the first phase is the phase of increasing viscosity and the second phase is the phase of decreasing viscosity. At a storage temperature of 55 °C, the viscosity of bubur pedas increases until the 3rd week and begins to fall in the 4th to 8th week. The same thing happened in a study conducted by Jang and Lee[8], where ready-to-eat chicken gingerbread at a storage of 25 ° C increased viscosity from week 0 to week 16 and dropped in the 20th week. An increase in viscosity is due to the swelling of starch which results in hydration and the development of rice components into the paste phase[13]. During high temperature storage there is a significant reduction in amylose[14]. Amylose is degraded to glucose which will reduce viscosity[15]

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3.2 Sensory Evaluation

Sensory evaluation is carried out by performing sensory tests on several test parameters, namely color, sense of follow-up, rancidity, aroma and viscosity. Panelists were asked to assess samples of bubur pedas stored every week in a row for 8 weeks. The results of the sensory evaluation produced are shown in Figure 2.

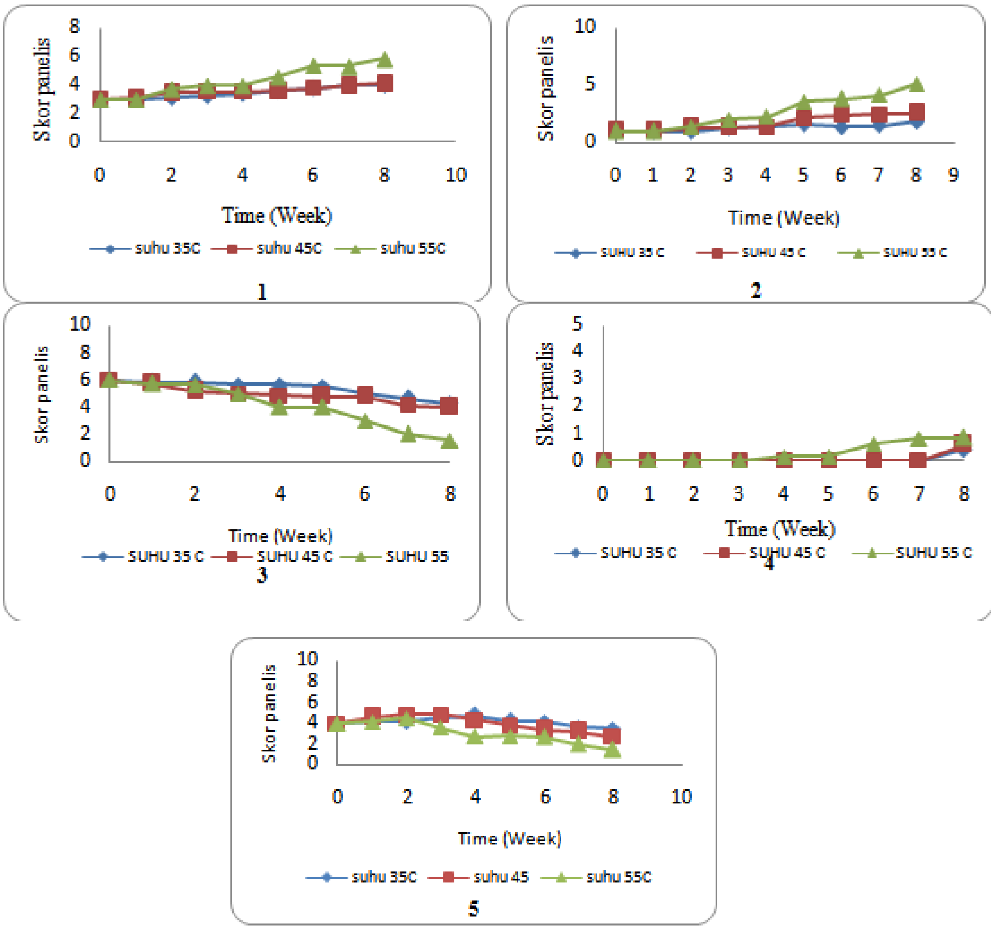

Figure 2. Results of the Sensory Test on a sample of canned Bubur Pedas during 8 weeks storage,(1) Color parameters, (2) sensory follow-up parameters, (3) rancid taste parameters, (4) Aroma parameters, and (5) Viscosity parameters

3.2.1 Color, Sense of follow-up and Rancid

The color parameters observed were changes in the color of the product in cans from the start of production until it was damaged. Figure 2 (1) shows the most rapid trend in color sensory quality changes in storage temperatures of 55^{o}C compared to storage temperatures of 35 ^{o}C and 45 ^{o}C. The initial color of the product is affected by seasoning. Spices will give the product taste, aroma and color[4]. A sense of follow-up (aftertaste) is the intensity of stimulation that was felt shortly after the stimulus was lost[12]. The intensity of the sense of follow-up increases and is directly proportional to the high temperature and storage time. Figure 2 (2) is an aftertaste parameter score during storage. Based on ANOVA results and Duncan's test showed storage of 35 °C and 45 °C there was no significant increase in follow-up feeling until 8 weeks. In contrast, at storage temperatures of 55 °C, significant increases in fluctuating changes occur from the 3rd to 8th week. Chemical interactions during storage cause changes such as taste, decreased antioxidant capacity or decreased organic acid content during storage due to damage to compounds during storage time[16]. Rancidity of canned bubur pedas due to unsaturated fatty acid oxidation. Fat oxidation goes through a complex chemical reaction that increases non-volatile and volatile components that cause off-flavor to occur even in very small amounts[15]. Sensory character depends on the degree of oxidation in food where fat oxidation is directly proportional to the production of off-flavor in food[16]. Based on the data in Figure 2 (3), until the 8th week all canned bubur pedas is still acceptable. In line with the results of the TBA analysis, the level of rancidity throughout the storage conditions of canned bubur pedas is still very low so that it is difficult to detect and until the 8th week all canned bubur pedas is still acceptabl, because rancidity is still very low.

3.2.2 Scent and Viscosity

Aroma is one of the main indicators in the determination of damage to porridge products in cans. The aroma that was identified in the fresh porridge product was a strong aroma of flavor. In Figure 2 (4) shows that the change in aroma began to occur in the 2nd and 3rd weeks on canned bubur pedas stored at 45 °C and 55 °C respectively. The change in aroma of canned bubur pedas stored at 35 °C began to occur in the 6th week. The aroma of bubur pedas without broken vegetable cans is identified as similar to the aroma of meat or broth. Storage temperature affects changes in the aroma of canned bubur pedas. The higher the storage temperature, the damage based on aroma occurs faster. Canned bubur pedas stored at 55 °C was declared damaged at 8 weeks based on the value of aroma quality. Fragrance changes are thought to occur due to maillard reactions. The maillard reaction is one of the main sources that causes the onset of off-flavor in food. Unwanted aromas can occur during the process or during storage[16]. Maillard reactions can occur by many factors such as water activity, presence of reactants, temperature and pH. At the storage temperature the reaction chamber tends to form scents such as roasting, burning, meat or like the smell of unwanted beans.

Viscosity is one of the main indicators in determining the level of damage and calculating the shelf life of canned bubur pedas. Viscosity changes are the same as changes in viscosity based on objective analysis. Viscosity changes are shown in Figure 2 (5), during storage there are 2 phases of change in viscosity, the first phase is the phase of increasing viscosity and the second phase is the phase of decreasing viscosity. The higher the storage temperature, the viscosity changes faster. Canned bubur pedas stored at 35 °C is more viscous until the 4th week and falls in the following week. Canned bubur pedas stored at 45 °C, the slurry becomes thicker until the 3rd week and starts to fall in the 4th to 8th week. While at 55 °C storage, the slurry becomes thicker until the second week and then decreases in the 3rd to 8th week.

IV. CONCLUSION

The conclusions of this study are based on the results of the study it was found that there was a change in quality during storage. Storage temperatures of 55 °C can reduce quality more quickly than storage temperatures of 35 °C and 45 °C especially for the color, aroma, taste and viscosity of canned bubur pedas products.

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