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Quality control of pasteurized milk products in aluminum foil packaging at dairy a, sleman, special region of yogyakarta

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ABSTRACT

Milk is a dairy farm product that contains various kinds of nutrients needed by humans. Bacteria easily contaminate milk, so it has a concise shelf life. One way to prevent bacterial contamination is by pasteurization. According to SNI 01-3951-1995, pasteurized milk has gone through a heating process of 72℃ for 15 seconds or heating at a temperature of 63-66℃ for 30 minutes. Company A's aluminum foil packaging pasteurized milk products are often defective. The defect is caused during the processing, preservation, and storage of milk that is not good. Therefore, quality control must be carried out in the pasteurization process of milk to ensure the quality of milk is maintained. Quality control is a process to assist in achieving products following the objectives. Quality control in the pasteurization process in company A needs to be discussed further to prevent defects in pasteurized milk in aluminum foil packaging. Attributes that affect milk quality are pH, color, texture, and aroma. The method used to determine the defect to milk is adjusted to the production in company A by taking 30% samples with a total of 3 production batches which are then analyzed for the type of defect, pH analysis with control charts, organoleptic quality analysis with scoring diagrams, and fishbone diagrams to determine the causative factors defect.
Keywords: milk, pasteurization, quality control, control charts, scoring diagrams, fishbone diagrams

INTRODUCTION

Milk is a dairy product that contains various kinds of nutrients needed by humans. Bacteria easily contaminate milk, so it has a short shelf life or is not durable. Therefore, proper handling of the milking process, production process, and distribution method must be carried out. In addition, testing and quality control must also be carried out so that it can be seen if milk is damaged or not so that it does not harm the human body. One way to extend the shelf life of milk is by pasteurization. According to SNI 01-3951-1995, pasteurized milk is milk that has gone through a heating process with a minimum temperature of 72℃ for 15 seconds or heating at a temperature of 63 – 66℃ for 30 minutes, then cooled to 10℃ and stored at a maximum temperature of 4,4℃ (Badan Standardisasi Nasional, 1995). Even though it has gone through the pasteurization process, milk has a shelf life of 7 days if stored in the refrigerator. According to(Hadiwiyoto, 2009), pasteurized milk will not spoil within seven days if it is put in a secure place or stored in a refrigerator with a temperature of ± 4℃. Damage to pasteurized milk can occur from receiving raw materials, processing, packaging, storage, and distribution. Milk that is damaged will experience changes in pH and physical changes. According to (Badan Standardisasi Nasional, 1998), the requirement for good quality milk is milk with a pH ranging from 6-7. If the pH of the milk is more or less than 6-7, it can be ascertained that the milk has been damaged. In addition, damaged milk will experience physical changes that can be seen directly, such as changes in pH, color, texture, and aroma.

Pasteurized milk products packaged in aluminum foil in company A often experience damage. Damage usually occurs after being stored in the chiller and cool room. Usually, several samples are damaged, such as changes in pH, color, texture, and aroma. This can be caused by contamination during

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the milk packaging process. The contamination will accelerate the deterioration of the milk. So it is necessary to do quality control to minimize or prevent damage to pasteurized milk in foil packaging.

Quality control is a process to assist in achieving products following the objectives. Activities that include quality control include: (1) assessing actual operating performance, (2) comparing with goals or standards, and (3) taking action if there is a difference (Muhandri & Kadarisman, 2012). The pasteurization process of milk must be carried out properly so that there is no bacterial contamination and the milk can last longer.

Quality control of pasteurized milk products in aluminum foil packaging in Company A needs to be considered and discussed further to maintain the milk quality so that it is not easily damaged. Milk with good quality has the attributes of pH, heat, texture, and pleasing aroma, following the quality requirements of milk. Quality control is needed so that pasteurized milk products have good quality following SNI.

The purposes of this study include: knowing the type of damage that occurs in pasteurized milk in aluminum foil packaging, knowing the quality control of pH attributes, pasteurized milk in aluminum foil packaging, knowing the organoleptic assessment of pasteurized milk that is damaged, and knowing the causes of damage to pasteurized milk in aluminum foil packaging. . The analytical method used was an analysis of the type of damage, pH analysis with p-charts, analysis of organoleptic quality, and causal analysis using fishbone diagrams.

RESEARCH METHOD

Materials

The tools used in this study were pH indicators, then the materials used in this study were Batch pasteurized milk (1, 2, 3), pH paper, label paper, and plastic.

Methods

This research was conducted from March 1 to March 30, 2021, at company A, Sleman, DIY. Data collection in this study includes interviews, field observations, data collection, data analysis, and conclusions. The analytical method used is damage type analysis, pH analysis using a p-chart, organoleptic quality analysis, and analysis of the causes of milk spoilage using a fishbone diagram.

RESULT AND DISCUSSION

Damage Type Analysis

The problems that often occur in pasteurized milk products are often damage. Pasteurized milk that has been damaged will experience both physical and chemical changes. Material changes that occur in pasteurized milk include color and texture. While the chemical changes that occur in pasteurized milk include: pH and aroma. The quality requirements for pasteurized milk that have good quality are:

1. pH

Good quality milk has a pH of 6-7 (Badan Standardisasi Nasional, 1998). If the pH of milk is below or above 6-7, then the quality of the milk has decreased or been damaged. The decrease in Ph indicates that the level of acidity in milk is higher.

2. Color

Good quality milk has a slightly yellowish-white color or a typical milk color (Lenowo, 2002). Milk that has experienced a decrease in quality will change color to yellowish-white or brownish-white.

3. Texture

Good-quality milk has a slightly thick texture but does not clot (Resnawati, 2020). Milk that has decreased in quality or is damaged will change its texture to lumpy and slimy.

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4. Scent

Good-quality milk has a distinctive aroma (Lenowo, 2002). Milk that has been damaged will experience a change in scent to be slightly sour or sour. According to (Buckle et al., 2007), damage to milk is caused by the formation of lactic acid due to lactose fermentation by E. Coli bacteria. Fermentation by these bacteria causes the aroma of milk to change.

pH analysis with p-chart

This pH analysis test was carried out to determine the pH value of pasteurized milk using pH indicator paper. This test aims to determine the quality or quality of pasteurized milk. According to (Badan Standardisasi Nasional, 1998), the condition for milk to have good quality is to have a pH between 6-7. If the pH is below or above 6-7, then the quality of milk will decrease and be damaged. For the milk sample used, there were three batches of production. For batch 1, there were 13 samples of milk, batch 2 consisted of 16 samples, and batch 3 consisted of 14 samples. With the use of p-chart analysis, we will get the results of how many samples are out of control.

Table I. Results of Ph Analysis in Batch 1, Batch 2, and Batch 3

BATCH 1		BATCH 2		BATCH 3	
Sample code	**pH**	**Sample code**	**pH**	**Sample code**	**pH**
K1	6	K2	6	K3	6
A1	5	B1	6	C1	5
A2	4	B2	5	C2	6
A3	6	B3	6	C3	6
A4	6	B4	5	C4	5
A5	5	B5	6	C5	6
A6	6	B6	6	C6	4
A7	6	B7	4	C7	5
A8	5	B8	6	C8	6
A9	6	B9	5	C9	4
A10	4	B10	4	C10	4
A11	6	B11	6	C11	6
A12	6	B12	5	C12	4
		B13	6	C13	4
		B14	5		
		B15	6		

Table II. Data on the Proportion of Total Product Defects for Batch 1, Batch 2, and Batch 3

Batch	Total of Sample	Total of Broken Sample	The proportion of Defect Sample	CL	UCL	LCL
1	13	5	0,385	0,465	0,693	0,237
2	16	7	0,438	0,465	0,693	0,237
3	14	8	0,571	0,465	0,693	0,237
Total	43	20				
P	0,465					
1-p	0,535					

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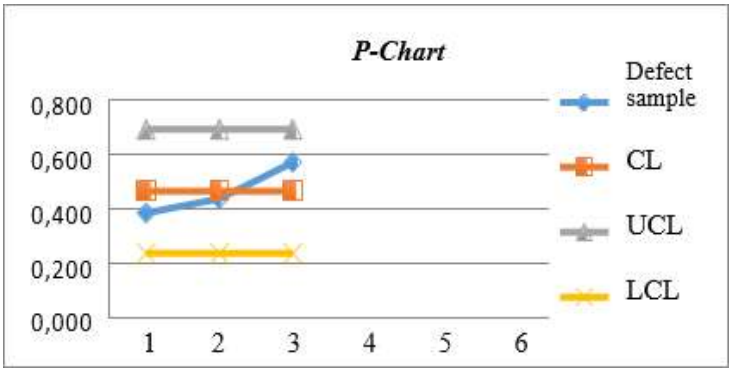

Figure 1. P-Chart Data Proportion of Product Defects Total Batch 1, 2, and 3

Based on the data in tables 1 and 2, it can be seen that the proportion of total defects in batch 1, batch 2, and batch 3 is p = x/n = 20/43 = 0.465. In batch 1, 5 samples were damaged, with a defect proportion value of 0.385. Then in batch 2, 7 samples were damaged, with a defect proportion value of 0.438. In batch 3, 8 samples were damaged, with a defect proportion value of 0.571. After knowing the proportion of product defects, then determine the value of the center line (CL), upper limit line (UCL), and lower limit line (LCL). The value of CL = p = 0.465, the value of UCL = 0.693, and the value of LCL = 0.237. After that, the data is plotted on a control chart (p-chart) according to Figure 1. Based on the analysis of the control chart (p-chart) of batch 1, batch 2, and batch 3, it can be seen that product defects or pH damage that occurs can still be controlled because it does not exceed the upper limit (UCL) and lower limit (LCL).

Organoleptic Quality Analysis

Organoleptic is a test of food ingredients based on preferences and tastes and willingness to use a product. Organoleptic test or sensory test or sensory test itself is a way of testing using the human senses as the primary tool for measuring the acceptability of products. Organoleptic testing has an essential role in the application of quality. Organoleptic testing can indicate spoilage, deterioration, and other damage to the product (Dhingra & Jood, 2002). Meanwhile, according to (Soekarto, 1985), an organoleptic test is a way of measuring, assessing, or testing the quality of a commodity or product by using the sensitivity of the human senses, namely the eyes, nose, mouth, and fingertips. An organoleptic test is also called subjective measurement because it is based on human subjective response as a measuring instrument.

Pasteurized milk has several quality requirements that must comply with SNI. According to the (Badan Standardisasi Nasional, 1995), pasteurized milk is fresh, reconstituted, or recombined milk that has undergone a heating process at 72 for 15 seconds. Immediately cooled for 10 minutes, then treated aseptically. Milk must be stored in the refrigerator at a maximum temperature of 10˚C so that microbes cannot grow and develop (Wardana, 2012). The quality requirements of pasteurized milk based on BSN (1995) can be seen in Table III.

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Table III. Pasteurized Milk Quality Requirements

Characteristics	Condition
Smell	Typical
Flavor	Typical
Color	Typical
Fat	2.8%
Lean solids	7.7%
Protein	2.5%

Assessment or scoring of the organoleptic quality of pasteurized milk products in company A consists of color, texture, and aroma. The samples observed and analyzed consisted of batch 1, batch 2, and batch 3, totaling 43 samples. The analysis was carried out by assigning a score to the entire sample. A sample with a score of 2 means that the sample has high quality, while a sample with a score of 1 means that the sample has low quality or has decreased in quality. The following are the scores for batch 1, batch 2, and batch 3:

Color scoring

Table IV. Color scoring for Batch 1, 2, and 3.

BATCH 1		**BATCH 2**		**BATCH 3**	
Sample code	**Score**	**Sample code**	**Score**	**Sample code**	**Score**
K1	2	K2	2	K3	2
A1	2	B1	2	C1	2
A2	1	B2	1	C2	2
A3	2	B3	2	C3	2
A4	2	B4	1	C4	1
A5	1	B5	2	C5	2
A6	2	B6	2	C6	1
A7	2	B7	1	C7	2
A8	1	B8	2	C8	2
A9	2	B9	2	C9	1
A10	1	B10	1	C10	1
A11	2	B11	2	C11	2
A12	2	B12	1	C12	1
		B13	2	C13	1
		B14	2		
		B15	2		

Description: Score 1 = Typical milk
Score 2 = Yellowish-white

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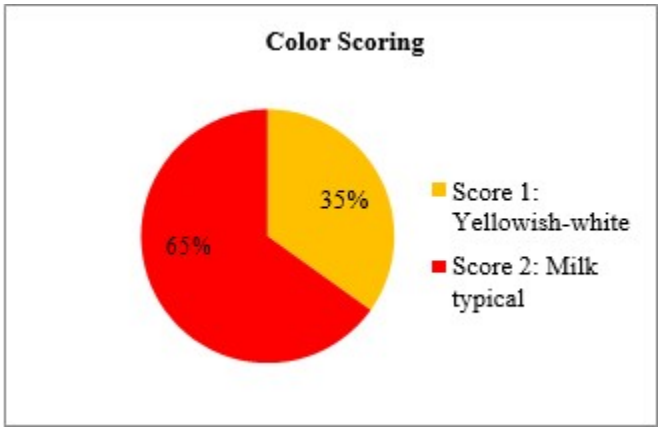

Figure 2. Diagram of color scoring for Batch 1, 2, and 3.

Based on the assessment of physical attributes, namely color, there are two assessment criteria: samples with a score of 1 are samples of low quality, namely samples that have changed color to yellowish white. A score of 2 is a sample with high quality, namely a sample with a distinctive color of milk following the quality requirements of pasteurized milk. The color scoring diagram shows all samples from batch 1, batch 2, and batch 3 with a total sample of 43 pieces. As many as 65% of the samples have a score of 2, which is the typical color of milk (high quality), then 35% of the samples got a score of 1, which is yellowish-white (low rate).

Texture Scoring

Table V. Texture is scoring for Batch 1, 2, and 3.

BATCH 1		BATCH 2		BATCH 3	
Sample code	**Score**	**Sample code**	**Score**	**Sample code**	**Score**
K1	2	K2	2	K3	2
A1	1	B1	2	C1	1
A2	1	B2	1	C2	2
A3	1	B3	2	C3	2
A4	2	B4	1	C4	1
A5	1	B5	2	C5	2
A6	2	B6	2	C6	1
A7	1	B7	1	C7	1
A8	1	B8	2	C8	2
A9	2	B9	1	C9	1
A10	1	B10	1	C10	1
A11	2	B11	1	C11	2
A12	2	B12	1	C12	1
		B13	2	C13	1
		B14	1		
		B15	2		

Description: Score 1 = Found lumps or slimy
Score 2 = No lumps

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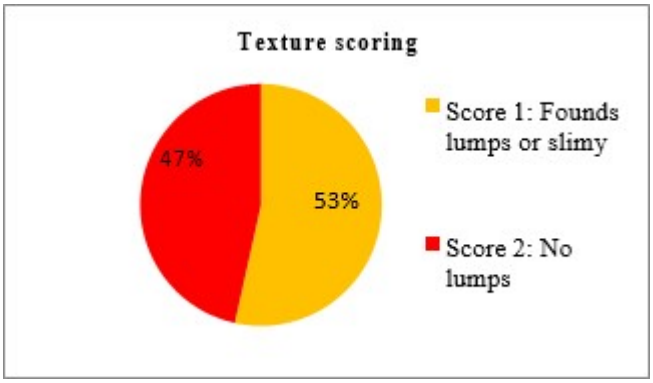

Figure 3. Diagram of texture scoring for Batch 1, 2, and 3.

Based on the assessment of physical attributes, namely texture, there are two assessment criteria, where samples with a score of 1 are samples with low quality, namely samples that have experienced changes in texture to become lumps or slimy. The score of 2 is a sample with high quality, namely a sample with a texture that does not get lumpy, following the quality requirements of pasteurized milk. The texture scoring diagram shows all samples from batch 1, batch 2, and batch 3 with a total sample of 43 pieces. There were 47% of the samples that had a score of 2, namely the texture was not lumpy (high quality), then 53% of the samples got a score of 1, namely the texture was lumpy or slimy (had low quality).

Scent scoring

Table VI. Scent scoring for Batch 1, 2, and 3.

BATCH 1		BATCH 2		BATCH 3	
Sample code	**Score**	**Sample code**	**Score**	**Sample code**	**Score**
K1	2	K2	2	K3	2
A1	1	B1	2	C1	1
A2	1	B2	1	C2	2
A3	2	B3	2	C3	2
A4	2	B4	1	C4	1
A5	1	B5	2	C5	2
A6	2	B6	2	C6	1
A7	2	B7	1	C7	1
A8	1	B8	2	C8	2
A9	2	B9	1	C9	1
A10	1	B10	1	C10	1
A11	2	B11	2	C11	2
A12	2	B12	1	C12	1
		B13	2	C13	1
		B14	1		
		B15	2		

Description: Score 1 = Sour
Score 2 = Typical milk

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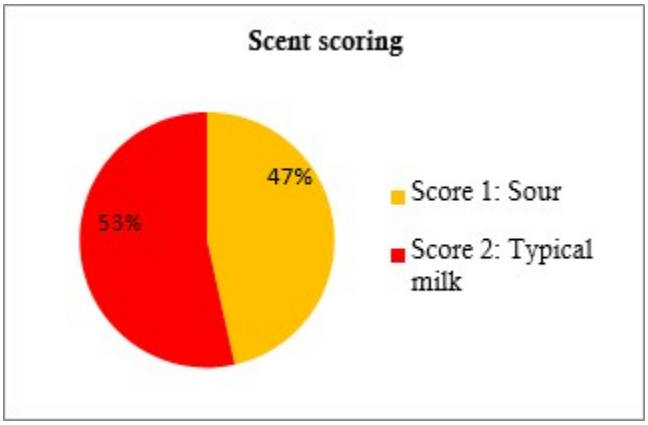

Figure 4. Diagram of aroma scoring of Batch 1, 2, and 3.

Based on the assessment of physical attributes, namely aroma, there are two assessment criteria, where samples with a score of 1 are samples with low quality, namely samples that have undergone a change in scent to sour. A score of 2 is the sample with high quality, namely the sample with a distinctive aroma of milk following the quality requirements of pasteurized milk. From the aroma scoring diagram, it can be seen that all samples from batch 1, batch 2, and batch 3 with a total sample of 43 pieces. As many as 53% of the samples had a score of 2, namely the distinctive aroma of milk (having high quality), then 47% of the samples had a score of 1, which was sour aroma (having low quality).

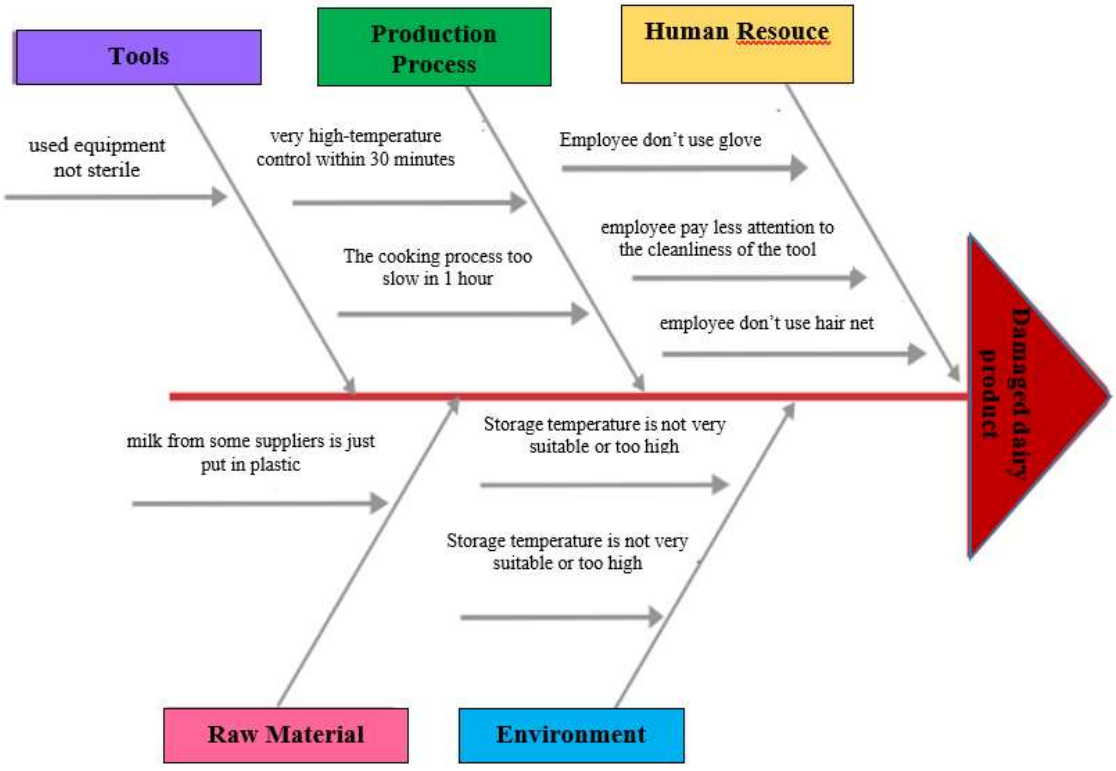

Figure. 5 Fishbone Diagram Causes Damage to Pasteurized Milk in Aluminum Foil Packaging

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Based on the analysis using the fishbone diagram above, the cause of the damage that occurs in pasteurized milk in aluminum foil packaging is that workers do not use gloves or hair nets and ignore cleaning equipment. These HR factors can cause contamination of dairy products. The production process uses a controlled temperature too high (73.5˚C – 75.5˚C) within 30 minutes. The controlled temperature is not following SNI, so that it can cause damage to the milk. The equipment used is also not sterile; it can cause contamination at temperature. Environmental factors Milk that has been packaged and is still hot is stored directly in the cool room; this can cause chemical damage to the milk due to direct heat transfer from hot to freezing temperatures. In addition, milk stored in the chiller is often damaged because the temperature in the chiller may be too high and cannot be controlled. Then the raw material factor, for raw materials from suppliers there, is some milk wrapped in plastic and not using milk cans. This can damage the milk on the way before the pasteurization process because milk from suppliers must be stored at cold temperatures in milk can containers so that it is not easily contaminated.

The most influential factors were workers not wearing gloves and hair nets, workers paying little attention to the cleanliness of the tools, and the equipment used was not sterile. Damage often occurs after storage in a cool room. This could happen because the milk was contaminated during packaging, caused by several factors.

CONCLUSION

The conclusion of the quality control of pasteurized milk products in aluminum foil packaging at company A is: The types of damage that occurs in pasteurized milk in aluminum foil packaging are damage to pH, color, texture, and aroma. Based on pH analysis, the total proportion of defects in batch 1, 2, and 3 samples was 0.465. Then for the balance of defective batch 1 = 0.385, batch 2 = 0.438, and batch 3 = 0.571. In the analysis of the control chart (p-chart) batch 1, batch 2, and batch 3, it can be seen that product defects or pH damage that occurs can still be controlled because they do not exceed the upper limit (UCL) and lower limit (LCL). Based on the analysis of organoleptic quality scoring, in color scoring, 65% of the samples had high quality, and 35% of the samples had low quality. Texture scoring found that 47% of the samples had high quality, while 53% had low scores. In aroma scoring, 53% of the samples had high quality, while 47% had low quality. The main causes of damage to pasteurized milk in aluminum foil packaging are workers not wearing gloves and hair nets, not paying attention to the cleanliness of tools, and equipment used is not sterile. Damage often occurs after storage in a cool room. This could happen because the milk was contaminated during packaging, caused by several factors.

REFERENCES

Badan Standardisasi Nasional. (1995). SNI 01-3951-1995 tentang Susu Pasteurisasi. In *Badan Standardisasi Nasional* (SNI 01-3951-1995). Badan Standardisasi Nasional.

Badan Standardisasi Nasional. (1998). SNI 01-3141-1998 tentang Susu Segar. In *Badan Standardisasi Nasional* (SNI 01-3141-1998). Badan Standardisasi Nasional.

Buckle, K. A., Edwards, R. A., Fleet, G. H., & Wootton, M. (2007). *Ilmu Pangan* (H. Purnomo & Adiono, Eds.). Universitas Indonesia Press.

Dhingra, S., & Jood, S. (2002). Organoleptic and nutritional evaluation of wheat breads supplemented with soybean and barley flour. *Food Chemistry*, *77*(4). https://doi.org/10.1016/S0308-8146(01)00387-9

Hadiwiyoto, S. (2009). *Teori dan Prosedur Pengujian Mutu Susu dan Hasil Olahannya: Teknik Uji Mutu Susu* (2nd ed.). Liberty.

Lenowo, A. M. (2002). *Sifat Kimiawi, Fisik, dan Mikrobiologis Susu*. Fakultas Peternakan, Universitas Diponegoro.

Muhandri, T., & Kadarisman, D. (2012). *Sistem Jaminan Mutu Industri Pangan* (Y. H. Frandy, Ed.). IPB Press.

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Journal homepage: http://journal2.uad.ac.id/index.php/jhsr
doi: 10.12928/jhsr.v3i2.6818

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Resnawati, H. (2020). Kualitas Susu Pada Berbagai Pengolahan dan Penyimpanan (The Quality of Milk and its Products on Several Processing and Storage). *Semiloka Nasional Prospek Industri Sapi Perah Menuju Perdagangan Bebas*.

Soekarto, S. T. (1985). *Penilaian Organoleptik: untuk Industri Pangan dan Hasil Pertanian*. Bhratara Karya Aksara.

Wardana, A. S. (2012). *Teknologi Pengolahan Susu*. Fakultas Teknologi Pertanian. Universitas Slamet Riyadi.