ATLANTIS PRESS

Advances in Social Science, Education and Humanities Research, volume 349

6th International Conference on Community Development (ICCD 2019)

Improving the Quality of Herbal Pasteurization Milk with the Application of the Equipment and Environmental Sanitation SOP

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Abstract*. KUBE PSP Maju Mapan is a milk supplier in Kemiri Jabung Village, Malang Regency, that seeks to develop its business units in addition to being a milk producer to be deposited to IPS. One business unit that will be developed is a pasteurization unit. Fresh milk units, as raw material for milk development Pasteurization in these SMEs, needs attention related to physicochemical quality and microbiology. Microbiological quality with a total plate count (TPC) indicator is important in providing pasteurization milk prices on IPS. Low TPC numbers will be able to provide benefits for SMEs because fresh intestine (fresh milk) has grade A. However, to get Grade A, it needs to be supported by sanitation tool and the environment, or in other words, it needs good handling. Therefore, it is necessary to have an SOP (Standard Operating Procedure) that must be carried out. The method used in the current study is a survey method with direct observation starting from obtaining information from SMEs, then the preparation of SOPs in stages, and then continuous training and mentoring with quality indicators of fresh milk and pasteurization units. Outputs generated from this program are Sanitation Tool and Environmental SOP units at the supplier level, which have been made in written and poster forms at the SME level. The impact of improved milk quality in terms of TPC values, chemical quality (fat and protein levels from January up to June) showed a significant increase, thus increasing the volume of milk produced by SMEs due to increased livestock interest in SMEs, and handling system evaluation. The indicator was that the TPC value decreased from 1.2 x106 cfu/ ml in January to 6, 05x 105Cfu / ml, increased the quality of milk with a fat content from 4.05 to 4.36%, protein content 2.89 to 3.01%.

***Keywords: Sanitation, SOP, tools, handling*.**

INTRODUCTION

Pasteurized milk is milk that has been warmed below the temperature 100 ^{0}C, or below the boiling point of the milk, the pasteurization method includes LTLT (Low-Temperature Long Time) by heating the milk at 65^{0}C for 30 minutes, HTST (High Temperature Short Time) with a 71-74^{0}C exposure for 15-30 seconds or at a temperature of 85 - 127^{0}C for 8 seconds. In the UHT (Ultra High Temperature) process which is carried out at temperatures above the boiling point of milk (100.16^{0}C) which is at a temperature of 140-150^{0}C for 1-2 seconds, it is categorized as a special discussion, because the process is generally applied by the Processing Industry Milk on a large scale [1].

Pasteurized milk is fresh milk which is heated at temperatures below 100^{0}C to kill pathogenic bacteria (causes of disease) and decompose bacteria, while the nutritional value of milk is maintained and beneficial bacteria are expected to remain alive. Pasteurized milk is liquid fresh milk which can be consumed in a relatively short time and cold conditions. The durability in cold conditions is generally around seven days. Therefore, a combination of other processing methods is carried out such as adding herbal and fresh compounds such as green tea, ginger, strawberry, rose, *secang*, mint leaves, and other spices to provide a natural and healthy taste, and to extend storage power. Herbal pasteurized milk is a healthy drink product to be introduced to children, adolescents, and the general public to get used to drinking fresh milk, provide additional nutrients that will support the growth of the body and brain and improve general health. In addition, it is expected that by increasing fresh consumption, it will automatically grow and raise the dairy farming business in this country, and the dependency factor on imports will be reduced.

Pasteurized milk with a taste of green tea and black tea, which is fresh milk with a conventional heating process, has been accepted by consumers by testing consumer preferences in 2016. Therefore, to improve the security and the quality of food and food consumed, it is necessary to apply the Standard Operating Procedure (SOP) to adjust the standards set by SNI to the facilities owned by SMEs, so that they can secure the security and the full quality of herbal pasteurized milk according to consumer demands. Research The application of SOP in the process of making herbal pasteurized milk at KUBE PSP Maju Mapan, Kemiri Village, Jabung District, Malang Regency is expected to improve the quality of the products produced so that it can produce pasteurized milk products having physicochemical and

microbiological qualities according to SNI. The study was conducted to determine the constraints and factors that influence the physical, chemical and microbiological quality of pasteurized herbal milk products with the application of SOPs on fresh milk collections and their production processes [2].

METHOD

Approach to the problem is through direct observation and field surveys. Visits, socialization, and training with monitoring every time a fresh milk collection at the farmer level and direct observation during the process of herbal pasteurized milk production. The research was conducted in two stages, namely: 1) The initial stage of making an SOP for fresh milk collection and its application, which has been carried out for as long as 6 months and continued up to now with indicators on monitoring physical quality (milk-specific gravity), chemistry (fat and protein), and mobilizing (total plate count / TPC) [6]; 2) The second stage of making SOP is its application for the process of herbal pasteurization milk with a manual/ conventional process which has been carried out for 6 months and continued until now during the production process (order system), with indicators of monitoring physical, chemical (protein and fat) quality) and microbiology (TPC) detection of E. coli bacteria. Physical testing by measuring Specific Gravity with Lactodensimeter and pH with pH meter, Testing Protein and Fat with Lactoscan, and TPC pouring method [3], and 3) Result analysis and reporting.

Pasteurized milk produced by KUBE PSP Maju Mapan, Kemiri Village, Jabung District, Malang Regency has been added with green tea and black tea. Table 1 shows an overview or appearance in producing herbal pasteurized milk in two ways. First, in the pasteurizing process, heating is carried out below the boiling point of milk (temperature 65^{0}C for 30 minutes), so that the nutritional value, consistency, and the taste of the milk does not change. Giving the taste of green tea and black tea is done manually using filter gauze, when the milk is still heated on the stove. Furthermore, it is cooled by giving ice cubes around the stainless pan, after a cold temperature of around 15-12^{0}C, milk is packaged in a plastic bottle/cup, and stored in a refrigerator at a temperature of 4-6^{0}C. The second method is pasteurized milk (temperature 65 time 30 minutes), cooled to a temperature of 45-50^{0}C, poured green tea or black tea herbal syrup, then put in the cooling mixer and cooled to 10-12^{0}C, then packaged and stored in the refrigerator temperature of 4 -6^{0}C.

Table 1 shows the general description of the process carried out in the manufacture of early herbal pasteurized milk, which is a manual process using pots and manual flavoring, when the temperature of milk is still hot or during pasteurization by pouring green tea or black tea on gauze filters and aroma, and the color of tea entering the milk in hot conditions. It is a less efficient process if it is carried out on a large capacity scale because it requires a long time in opened conditions so that the potential of being contaminated by microbial will be greater [4]. Then, the second stage is done to make the time more effective, by making green tea syrup and black tea first, in sterile conditions and stored at room temperature. The second stage of the pasteurization process, exactly the same as the initial stage, but the aroma of herbal flavor at the time after pasteurization is at the temperature of 50 ^{0}C.

Table 1. General description of the process of herbal pasteurized milk production in SME Locations

Activity to do	First Stage	Second Stage	After SOP
Raw Milk	-	-	+
- Quality Control			
Control of Pasteurization Temp	+	+	+
Control of Packaging	-	+	+
Control of Result Product Washing	-	+	+
Manchine/Pan			
- Pasteurization Pan	+	+	+
- Filler Manchine	-	+	+
Pasteurization Room			
- Control of Personil	-	-	+
- Room cleanliness	Poor	Poor	Good
Packaging Room			
Separated	-	-	+
Closed	-	-	+
Sterillisation room Personil involved	-	-	+
- Appropriate Knowledge	-	+	+
- Skill/Experience	-	+	+

(+): exist, (-) : not exist

The results obtained by the second stage process are aseptic, and the process is more effective. However, there are some disadvantages, namely the herbal aroma of green tea and black tea is reduced if the syrup storage is not hygienic; it could easily form mold. Next is the SOP of the process of herbal pasteurized milk, with the aim of producing safe products and keeping the aroma of herbal flavors, the following stages were conducted: (1) receipt of fresh milk from farmers to suppliers according to SOPs that have been socialized and POSTERs registered copyright no.000132853 / 2019 / Standard Operating Procedure (SOP) of Fresh Milk Collection at Supplier (https://e-hakcipta.dgip.go.id), (2) quality control of raw materials for fresh milk, rooms and personnel is carried out, this involved using simple sterilization with 70% alcohol, to make aseptic conditions, (3) sterilization of alcohol and heating packages, (4) temperature control and pasteurization time according to the provisions of SNI-01-3951-1995, (5) temperature control rapid cooling after pasteurization by using coolant with agitator, (6) control of filling in the packaging in sterile room, (7) packaging aseptically, (8) storage in the refrigerator at 4 - 5^{0}C and organoleptic control is carried out periodically (per 4 days to 28 days), then distributed with controlled cool box [5].

The order of pasteurization process after SOP—standard, cool, mix, hom, past, container, and distribution—can be regarded as standard processing of pasteurized milk which is the same as done in the Milk Processing Industry (IPS). Such process shows efficiency in production [6].

Table 2. Flow of pasteurized milk production process carried out

No	Processing Standard Flow Processing		Sequence First Stage	Second Stage	After SOP
1	Raw	Milk Acquired	not standard	standard	standard
2	Mix	Mixing	cool	cool	cool
3	Cool	Cooling unit	past	past	mix
4	Hom	Homogenization	mix	mix	hom
5	Past	pasteurization	-	-	past
6	Cool	Fast Cooling	wait until cold	wait until cold	cooler
7	Pack	Packaging	Pack	Pack	Pack
8	Stor	Storage	cool storage	cool storage	cool storage
9	Dist	Distribution	dist	dist	dist

Table 2 shows the difference in process flow between the early stages of pasteurized milk production, the second stage, and after it is made and the SOP was applied. Pasteurized milk produced by KUBE PSP Maju Mapan with the application of SOP is more efficient in production because the waiting time until the cold temperature is faster because it is assisted by fast cooling devices, so the possibility of contamination or microbe contamination is less, and microbial growth is inhibited. According to the opinion of Legowo (2009), cooling prevents the growth of thermophilic microbes and most mesophilic microbes [7].

Tables 3 and 4 show the physicochemical and microbiological qualities of herbal pasteurized milk, before the application of SOPs and after the application of SOPs began. Fresh milk produced after the application of SOPs on milk collections from farmers shows a higher chemical quality than the absence of SOPs, this shows that the SOP of fresh milk receipts applied to supplier improve the milk quality, so milk prices from supplier and IPS will also increase. The physicochemical quality of herbal pasteurized milk after SOP is not much different from the quality of fresh milk after SOP; this indicates that the process of herbal pasteurized milk produced by KUBE PSP Maju Mapan is in accordance with SNI -013951-1995.

Table 3. Physicochemical description of pasteurized milk at the beginning and after the SOP

No	Type of Milk	pH	Density	Protein (%)	Fat (%)
1	Fresh Milk (before SOP)	6.66	1.024	2.89	4.05
2	Fresh Milk (SOP)	6.70	1.026	3.01	4.36
3	Pasteurization Milk 1st Stage	6.65	1.027	2.80	4.00
4	Pasteurization Milk 2nd stage	6.67	1.027	2.79	3.80
5	Pasteurization Milk (SOP)	6.72	1.026	2.90	4.10

SOP = *Standard Operational Procedure*

Microbiology quality is shown in Table 4. It was obtained by measuring qualitatively the presence of E. coli bacteria and the number of bacterial colonies (cfu/ml) just before the application of SOPs on receiving fresh milk from farmers to check if bacterial suppliers are present or not. After applying SOP to milk fresh, no more E. coli was found for six months of observation with monthly sampling. According to SNI -3141.1: 2011, maximum contamination or TPC is 1x 106 cfu/ml, while in Table 4, it is shown that fresh milk after the application of SOP is around 6.05 - 1.2 x 106cfu/ml, or an average of 9,025x105 cfu/ml. This shows that with the application of SOP, TPC of fresh milk can be lowered and in accordance with SNI standards [5].

Herbal pasteurized milk which is processed according to the applied SOP shows lower TPC compared to before the application of SOP, which is from the range of 8.06 -10.10x105 cfu/ml, to 3.03 3.54 x 104 cfu/ml. This is also in accordance with SNI standard no. 01-3951-1995, which requires a maximum TPC of pasteurized milk of 3 x104 cfu/ml.

Table 4. Microbiological description of pasteurized milk at the beginning and after the SOP

No	Type of Milk	*E. coli*	TPC (cfu/ml)
1	Fresh Milk (before SOP)	+	$1.30x10^6$ _ $2,12 x 10^6$
2	Fresh Milk (SOP)	-	$6.05x10^5$ _ $1.20 x 10^6$
3	Pasteurization Milk 1st Stage	-	$7.03x10^5$ - $9,02x10^5$
4	Pasteurization Milk 2nd stage	-	$8.06x10^5$ _ $10.10x10^5$
5.	Pasteurization Milk (SOP)	-	$3.03x10^4$ _ $3.54 x10^4$

According to Elok Zubaidah et al. [8], none of the pasteurized milk circulating in the Malang municipality is microbiologically fulfilling the 1993 SNI standard, while the physicochemical quality meets the 1993 SNI requirements. It can explain that pasteurized milk produced by SMEs or cooperatives circulating in Malang Municipality still use synthetic flavors and have not applied SOP correctly [8].

CONCLUSION

The results of this study and the discussion conducted can be concluded as follows:

Implementation of SOP (Standard Operational Procedure) in fresh milk collection at the farmer level up to suppliers at KUBE PSP Maju Mapan Kemiri District Jabung Malang Regency effectively decreases the value of TPC and increases the physicochemical quality of fresh milk, so that fresh milk is obtained according to the SNI standard.

Better management of production processes in raw pasteurized milk (fresh milk) and the correct application of SOP in the process of herbal pasteurized milk production ensures the production of quality pasteurized herbal milk products (green tea and black tea flavors) according to the national standard SNI 01-3951-1995.

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