

Characteristics of cream cheese made from Lampung farmers milk as impact of stabilizers application on different curd recovery

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IJASR 2022

VOLUME 5

ISSUE 2 MARCH – APRIL

ISSN: 2581-7876

Abstract: The study's objective was to evaluate the cream cheese characteristics made from Lampung farmer's milk improved by combining 2% xanthan gum and 1% gelatin as stabilizers on different curd recovery ways. The cream cheese samples were prepared by three treatments, namely (T1) stabilizer application on curd without whey separation, (T2) no stabilizer application on curd with whey separation, and (T3) stabilizer application on curd with whey separation. All experiments were repeated three times. Results demonstrated that the addition of stabilizer (xanthan gum and gelatin) with or without whey separation had a better impact on the proportional protein, fat, yield, and texture, and spread ability. In addition, stabilizer addition had no adverse effect on the color, taste, and aroma of all cheese cream. Nevertheless, cream cheese without whey separation had higher moisture content than those with whey separation even though with stabilizer added. Therefore, it was possible to explore cream cheese made from Lampung farmers' milk with a stabilizer and whey separation application.

Keywords: cream cheese, xanthan gum, gelatin, Lampung farmers milk

1. Introduction

Lampung Province has dairy cows spread across West Lampung, Tanggamus, South Lampung, East Lampung, Central Lampung, West Tulang Bawang, and the city of Metro [1]. Generally, milk handling in small, medium enterprises (SME) production centres in Lampung is in the form of pasteurized fresh milk [2], which has a limited shelf life, so it is necessary to diversify products that have a higher shelf life, remain nutritious, are easily transported and marketed. One of the processed products that are quite popular with the public and have a longer shelf life than pasteurized milk, among others, is cream cheese. This cheese product described as a soft, spreadable, processed product without ripening (un-ripened cheese) [3], which has an adequate storage capacity for fresh milk and is also rich in calcium, phosphorus, riboflavin, and vitamins [4]. The cream cheese attractiveness increases with its enlarged use in the food sector, such as an ingredient in the bakery industry and its role in the product structure, contributing to functional properties, including rheological properties and texture. Besides, cream cheese is broadly used for cheese-flavoured spread products and also various cheesecakes resource.

During cream cheese manufacture, the part of the whey is separated from the curd to concentrate the curd concentration to eliminate the syneresis. Nevertheless, there are still whey residues in the cheese that can source undesirable syneresis in cream cheese. Thus, the addition of stabilizers in cream cheese products needs to prevent syneresis during storage [5]. Many stabilizers could be added to cream cheese, including xanthan gum, guar gum, tragacanth gum, karaya gum, tara gum, and gellan gum [3] singly or in a combination of these stabilizers. This study used a mixture of xanthan gum (XG) and gelatin as a stabilizer. Patel et al. [6] resumed that XG is a polysaccharide hydrocolloid consisting of β -1,4-D-glucopyranose glucan backbone, composed of mannose (β -1,4), glucuronic acid (β -1,2), and terminal mannose residues. Gelatin is a critical hydrocolloid high molecular weight polypeptide which functions to increase elasticity, consistency, and stability [7].

Cream cheese products could be prepared in a process that does not involve whey separation. However, whey separated during cheese manufacture, making a by-product borders productivity and a loss of potential protein [8]. Hence, this recovery technique needs gum addition to eliminate the high-water content of cream cheeses. There is little information regarding applying a stabilizer mixture of xanthan gum and gelatin to the whole coagulated protein

with and without whey separation on cream cheese made from Lampung farmer's milk. The stabilizer, even in small concentrations addition could affect the rheology of the food system. Hence, the purpose of this study was to determine how the stabilizer: XG and gelatin added to different curd recovery affect the characteristics of cream cheese, especially the texture, spread ability, nutrition, and yield

2. Material and method

Milk for the manufacturing of cream cheese was procured from the dairy farm of small-medium enterprises from Lampung farmers. The freeze-dried mesophilic culture was used for cheese acidification, while rennet was used as a coagulant in cream cheese manufacturing. The hydrocolloids used were a combination of xanthan gum and gelatin.

The fresh milk was first prepared in three lots, namely T1, T2, and T3, where (T1) was for stabilizer application on curd without whey separation, (T2) was for stabilizer application on curd with whey separation, and (T3) was for no stabilizer application on curd with whey separation. Each lot was then heated/pasteurized at 72°C for 15 min and cooling to 23°C. Pasteurized milk was inoculated with a mesophilic starter culture and 0.05% rennet and incubated at this temperature until the pH reached a value of 4.7. After coagulation, the curd was heated and filtered using a cheesecloth to separate whey of T2 and T3, and one lot (T1) of the whey was retained. After whey separation, salt (1% w/w), xanthan gum (2%), and gelatin (1%) were added to one lot (T2), while another lot (T3) was no xanthan gum and gelatin addition. Finally, samples were homogenized and cooling to 4-6°C for the following evaluation of physicochemical and sensory.

3. Results and discussion

3.1 Physico and chemical characteristic of cream cheese

Table 1 presents the fresh cream cheese characteristics, which revealed that cream cheese of T1 (stabilizer application on curd without whey separation) has comparable highest fat, protein, salt, yield, and moisture content, followed by T2 (stabilizer application on curd after whey separation). This composition of T1 cream cheese could be attributed to the cheese whey content as there was no whey separation on this treatment. Likewise, the T2 treatment had comparable protein, fat, yield, and moisture content higher than those of T3 (no stabilizer application on curd after whey separation), due to the stabilizer application could bind some whey cheese from syneresis. Cheese whey is of great importance in the milk industry due to about 60-90% of the volume used for cheese production is converted to whey, which retains nutrients contained in milk. Irkin [9] stated that whey comprises 45%–50% of total milk solids, 70% of milk sugar (lactose), 20% milk protein, 70%–90% of milk minerals, and practically all the water-soluble vitamins present in the milk.

Table 1. Physico and chemical characteristic of cream cheese (wet basis)

Parameters	T1	T2	T3
Protein (%)	9.82±0.73	7.65 ± 0.50	4.97±0.14
Fat (%)	7.68±1.08	1.49±0.39	0.613±0.04
Salt (%)	1.34±0.24	1.28±0.24	0.787±0.12
Moisture (%)	81.05±1.78	68.1±5.73	64.29±4.45
Yield (%)	47.85±5.9	30.29±3.47	31.39±3.93
pH	5.02 ±0.09	5.02±0.09	5.02±0.09

The results presented in Table 1 also indicated that stabilizer treatments did not affect significant differences in the cream cheese pH. All treatments had standard pH of the cream cheese that was about 5.02. Gum xanthan and gelatin are applied in a small amount of 1-2%, and their pH properties are neutral.

Even though the T1 treatment seemed to have higher nutrient and yield content, it had high moisture content (81.05%) beyond the standard of the cream cheese. Likewise, the moisture content of the T2 and T3 of the cream cheese was higher than the standard of FDA, indicated that either the whey separation or concentration of the stabilizer was not optimal yet. According to the United States Food and Drug Administration (FDA) regulations, cream cheese's moisture contents should not be more than 55% [10].

3.2 Evaluation on sensory characteristics of cream cheese

In terms of sensory (Table 2), a highly significant effect of stabilizer addition and whey separation on texture and spread ability of cheese cream, while those effects on the taste, color, and aroma were not different. The effect of stabilizer addition on cheese cream, either with or without cheese whey removing, had good benefits. Their texture and spread ability on bread had a higher score than those without stabilizer addition. The stabilizer used in this study was a combination of xanthan gum 2% and gelatin 1% that acted as hydrocolloid to bind water and act as a gelling agent. These hydrocolloids were adsorbed on newly formed droplets and showed surface-active properties, and electrostatic forces prevented aggregation during homogenization [10]. In fresh sour curd cheese, hydrocolloids will bind and interferes the protein network interaction, results in a softer product and improves the cheese cream properties as expressed in the study reported by Gulzar [10] and Cankurt [11].

However, the maximum score of texture (3.15) and the spread ability (3.83-4.05) of cheese cream in this study were below those in control (commercial product). These results suggested that cheese cream processing based on Lampung farmer milk still needs improvement in the process or in suitable hydrocolloid used. During the stabilizer's addition, the cream cheese curd is usually heated (>70°C) and stirred to increase the dispersion and hydration of the stabilizer in the aqueous phase of cream cheese.

Table 2. Sensory characteristic of cream cheese

Parameters	Commercial Cheese Cream	T1	T2	T3
Color	4.4±0.44	3.95±0.32	3.9±0.34	4.2±0.40
Aroma	4.4±0.54	3.90±0.28	3.6±0.4	3.8±0.28
Taste	4.2±0.83	2.85±0.74	2.4±0.65	2.65±0.19
Texture	4.8±0.44	3.15±0.98	2.2±0.4	1.4±0.28
Spreadability	4.4±0.54	4.05±0.76	3.35±0.1	2.2±0.54

Color score: from 1 (yellowish) to 5 (milky-white)
 Aroma score: from 1(no aroma) to 5 (very distinctive cheese aroma)
 Taste score: from 1 (no taste) to 5 (very distinctive cheese taste)
 Texture score: from 1 (not smooth) to 5 (creamy and smooth)
 Spreadability: from 1 (could not be spread) to 5 (very easy to spread)
 T1 = Stabilizer application on curd without whey separation,
 T2= Stabilizer application on curd after whey separation,
 T3 =No stabilizer application on curd after whey separation

4. Conclusion

Stabilizers (XG and gelatin) addition to different curd recovery affects the characteristics of cream cheese made from Lampung farmers milk, especially the texture, spreadability, nutrition, and yield but no effect on the color, taste, and aroma of cream cheese.

Acknowledgements

The authors acknowledge University of Lampung through Postgraduate Grant (Hibah Pasca Sarjana) BLU Unila 2020 for financial research assistance.

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