

ASPECTS OF STORAGE DURATION AND GENERATION OF YOGURT AS STARTER IN MAKING YOGURT UNDER ROOM TEMPERATURE

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ABSTRACT

To find out how to get good and standard yogurt using yogurt as starter, this study was conducted to determine storage duration and generation of the yogurt used as starter to make yogurt under room temperature. *Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus thermophilus* were used to make yogurt under 45⁰C, to be used as starter. Bacterial growth, pH and acidity were observed every hour. Yogurt refrigerated for 1, 4, 7, 10, 13 and 16 days were then tested as starter at the rate of 5% in making yogurt, incubated at 45⁰C as well as at room temperature (29⁰C). Yogurt which was kept for 1 and 7 days were then used as starter to make yogurt under 45⁰C and room temperature (first generation). Five percents of each 1st generation-yogurt was then used as starter for 2nd generation- yogurt, etc. until 6th generation. Tests for yogurt quality comprised of pH, acidity, moisture content, bacterial count and the presence and identification of *Salmonella* and *Staphylococcus*. Factorial analysis of variance followed by Duncan's multiple range tests was performed. It was found that yogurt could be used as starter kept under refrigerator temperature for 16 days up to 6th generation for making yogurt under room temperature of incubation meeting the standard of quality without any contamination of undesirable bacteria.

Key Words: Yogurt Starter, Yogurt Storage, Yogurt Generation

INTRODUCTION

Yogurt is a fermented dairy product, resulting from the growth of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* bacteria in warm milk, characterized by smooth, viscous gel with delicate walnuts flavor (Kosikowski, 1978). Yogurt can be used as a starter to further make yogurt, because the already presence of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* (Mahmudah, 1997; Rihastuti, 2000).

Yogurt was made successfully using yogurt as mixed starter under incubation temperature of 45⁰C (Mahmudah, 1997) and under room temperature (Rihastuti, 2000) meeting the standard of good yogurt. With these findings, consumers can make yogurt themselves easily using yogurt as starter. The principle of the use of yogurt as starter is a process of regeneration of the bacteria, which is maintaining their inherited characteristics (Schiegel, 1994).

This trial was conducted to determine 1) storage duration and 2) until what generation yogurt can be used as mixed starter in yogurt making and 3) whether with incubation under room temperature (from 27 to 29⁰C), can produce yogurt meeting the standard.

MATERIALS AND METHODS

Lactobacillus delbrueckii subsp. bulgaricus and *Streptococcus thermophilus* were used to make yogurt under 45°C, further to be used as starter. Bacterial growth, pH and acidity were observed every hour. Yogurt refrigerated for 1, 4, 7, 10, 13 and 16 days were then tested as starter at the rate of 5% in making yogurt, incubated at 45°C as well as at room temperature (29°C). Yogurt which was kept for 1 and 7 days were then used as starter to make yogurt under 45°C and room temperature (first generation). Five percents of each 1st generation-yogurt was then used as starter for 2nd generation-yogurt, etc. until 6th generation. Tests for yogurt quality comprised of pH, acidity, moisture content, bacterial count and the presence and identification of *Salmonella* and *Staphylococcus*. A 2X6- and 2X2X6 factorials were used in the analyses of variance for the data of yogurt as starter and generation determination, respectively, followed by Duncan's multiple range tests.

RESULT AND DISCUSSION

Starter

Quality of yogurt as yogurt starter was found to have bacteria count of *Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus termophilus* to be 51.5(10)⁸/ml and 80.5(10)⁸/ml, respectively, pH of 4.43 and acidity of 1.45%. Incubation was terminated in four hours at the time the pH of 4.65 was reached. Room temperature was 29±0.2°C, with the humidity of 75±0.3%.

Quality of yogurt

In terms of storage duration, yogurt stored up to 16 hours was still good to be used as starter, as the yogurt made using the starter had the standard criteria of good quality (Table 1). In terms of generation, yogurt could be used as starter up to 6th generation (Table 2).

These findings are in accordance with Rihastuti (1996) who stated that mixed yogurt used as starter could be used as starter to produce yogurt with acidity, pH and dry matter ranging from 0.82 to 1.07%, from 4.73 to 5.53, and from 10.22 to 13.90%, respectively. Good quality yogurt was determined to have standard of pH ranging from 4.4 to 4.5 and acidity of 0.85 to 1.0% (Lampert, 1975; Kosikowski, 1978). According to Kurman *et al.* (1992), minimum bacteria count was 10⁸ to 10⁹/ml. Indonesian National Standard (SNI-01-2981-1992) stated that acidity should be in the range from 0.5 to 2.0% with no *Salmonella*.

Table 1. Quality of yogurt using yogurt as starter under different storage durations

	Days of starter storage duration					
	1	4	7	10	13	16
<i>L delbrueckii subsp bulgaricus</i> (10 ⁸)/ml	31.30 ^a	13.58 ^b	7.58 ^b	7.31 ^b	6.02 ^b	5.81 ^b
<i>S termophilus</i> (10 ⁸)/ml	32.80 ^a	16.30 ^b	13.20 ^{bc}	5.38 ^{bc}	3.21 ^{bc}	1.96 ^c
pH	4.82 ^a	4.78 ^{ab}	4.67 ^{abc}	4.64 ^{abc}	4.44 ^{bc}	4.37 ^c
Acidity (%)	0.80	0.89	0.91	0.94	1.03	1.21
Dry matter (%)	11.53	11.20	12.23	11.73	11.52	11.55

^{a,b,c}Means with different superscript differs ($P < 0.05$).

Table 2. Yogurt quality in different generations

	Generation					
	1	2	3	4	5	6
<i>L delbrueckii subsp bulgaricus</i> (10^8)/ml	21.96 ^a	12.86 ^b	11.03 ^{bc}	8.47 ^{bc}	4.50 ^{bc}	2.59 ^c
<i>S termophilus</i> (10^8)/ml	38.47 ^a	28.47 ^{ab}	19.35 ^{bc}	7.66 ^{cd}	5.06 ^d	2.93 ^d
pH	4.62 ^a	4.60 ^{ab}	4.54 ^{abc}	4.40 ^{bcd}	4.36 ^{cd}	4.32 ^d
Acidity (%)	1.11	0.91	1.00	1.02	1.05	1.02
Dry matter (%)	13.97	12.09	12.97	12.76	12.71	12.66

^{a,b,c,d}Means with different superscript differs ($P < 0.05$).

As mentioned earlier, that yogurt could be used as starter up to 6th generation. It means that the potential and characteristics of yogurt could and should be maintained as stated by Schiegel (1994). In microorganisms, the enzyme characteristics are known as biochemical inherited factors.

Identification of *Salmonella* and *Staphylococcus*

Under room temperature, neither *Salmonella* nor *Staphylococcus* was found, due to the presence of secondary metabolic substance, which is *bacteriostatic* and *bacteriocide* in nature (Bagiana and Hastowo, 1992). In accordance, Frazier and Weathof (1978) stated that yogurt is a product of milk fermentation from *Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus thermophilus* producing lactic acid in short time and large amount, so that other microorganisms can be killed. With the presence of lactic acid, the pH will decrease and unwanted bacteria such as the growth of *Clostridium*, *Staphylococcus* and *Pseudomonas* are inhibited as also reported by Rihastuti (2000).

CONCLUSION

It is concluded that yogurt could be used as starter kept under refrigerator temperature for 16 days up to 6th generation for making yogurt under room temperature of incubation meeting the standard of quality without any contamination of undesirable bacteria.

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