Pak. J. Biotechnol. 16 (1) 13-20 (2019) pISSN: 1812-1837 eISSN: 2312-7791 www.pjbt.org
http://doi.org/10.34016/pjbt.2019.16.1.3

INFLUENCE OF SKIM MILK AND SUCROSE ON THE VIABILITY OF LACTIC ACID BACTERIA AND QUALITY OF PROBIOTIC COCOGHURT PRODUCED USING STARTERS *Lactobacillus casei* subsp. *casei* R-68 AND *Streptococcus thermophilus*

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Article received 11.01.2019, Revised 27.01.2019, Accepted 7.2.2019

ABSTRACT

Cocoghurt is made from the main raw material of coconut milk. In this study, the effect of skim milk and sucrose on the viability of lactic acid bacteria (LAB) was examined together with the impact on the quality of cocoghurt produced. *Lactobacillus casei* subsp. *casei* R-68 and *Streptococcus thermophilus* were used as starter cultures. The study was carried out experimentally using a Completely Randomized Design with the variations of both skim milk and sucrose concentrations. The data found were statistically analyzed using ANOVA and then continued with DNMRT at 5% level. Parameters observed were total LAB, pH, total lactic acid, total solid, protein, moisture and ash contents as well as total fat and fatty acid profile. The results showed that the addition of skim milk (2.5%) and sucrose (5.0%) produced cocoghurt which met the quality standard. Cocoghurt produced using skim milk 5.0% and sucrose 7.5% had the characteristic of being slightly white, tasting sour and sweet, with an aroma of coconut milk; the texture was rather thick and preferred by the panelists. Probiotic cocoghurt showed that fatty acid profiles were dominated by medium-chain saturated fatty acid 72.90% followed by long-chain saturated fatty acid 13.11% and unsaturated fatty acid 7.28%.

Keywords: Cocoghurt, skim milk, *Lactobacillus casei*, coconut milk, viability

INTRODUCTION

Indonesia is one of the largest coconut producer in the world, with 18.3 million tons per year in various regions. Riau Province is the largest coconut producing area in Indonesia with an area of 520,260 Ha from a total of 3,654,520 Ha, with coconut production of 427,080 tons in 2015 and 418,250 tons in 2016 (Indonesian Central Bureau of Statistics, 2017). Coconut production is mostly located in Indragiri Hilir Regency with an area of 442,335 Ha and production of 360,959 tons in 2016 (Riau Statistic Center, 2017).

Coconut milk is one of the many processed food products from coconut. However, coconut milk is still very limited in terms of incorporation into traditional snacks. Coconut milk also has the potential to be used to produce the functional food, cocoghurt through a fermentation process using probiotic lactic acid bacteria (LAB). Cocoghurt may possess therapeutic benefits since it contains medium chain fatty acids (MCFA). The major MCFA present in coconut milk is lauric acid which has many health benefits such as increasing immunity as well as being an antimicrobial agent. In addition, cocoghurt contains *Streptococcus thermophilus* and *Lactobacillus bulgaricus*, both probiotic bacteria. *Lactobacillus casei* subsp. *casei* R-68 isolated from *dadih*, a fermented food from buffalo milk from West Sumatra, Indonesia represents another local probiotic (Hosono *et al*., 1989). Strain R-68 so far has been reported to have the ability to survive in acid and bile conditions in *in vitro* studies that make this strain survive through the stomach acid and grow in the digestive tract (Pato, 2003; Surono, 2003). This strain also exhibited anti-cancer property through its ability to bind with the mutagenic compounds (Pato, 2003; Surono, 2003; Hosono *et al*., 1990; Surono *et al*., 2009), as well as the ability to reduce cholesterol levels in rat through the process of taurocholic acid deconjugation (Pato and Hosono, 2004). *L. casei* subsp. *casei* R-68 is also able to inhibit the growth of food borne pathogens *in vitro* by production organic acid (Pato *et al*., 2017). Some other probiotic inhibit patogenic microorganisms by bacteriocin (Ketaren *et al.*, 2018; Monafatia *et al*., 2018; Baksh and Kareem, 2018). Finally Strain R-68 is able to reduce the activity of β-glucuronidase and β-glucosidase, enzymes in the digestive tract that converts procarcinogen to carcinogens. The R-68 strain therefore meets the criteria and requirements of probiotic to be used as a starter culture in producing cocoghurt.

Coconut milk can be used as raw material for fermented beverages, namely cocoghurt because coconut milk has the color and chemical content resembles cow milk, and the nutritional content in coconut milk is suitable for the growth of LAB. Pure coconut milk consists of 54.9% water, 34.3% fat, 5.6% carbohydrate, 4.2% protein and 14 mg calcium and 1.9 mg phosphorus (Anugrah, 2011), while cow's milk consists of 87.25% water, 12.75 % dry matter, 3.80% fat, 4.80% sugar, 3.5% protein and 0.65% minerals (Eckles *et al*., 1988). In this study the use of both *Streptococcus thermophylus* and *Lactobacillus casei* subsp. *casei* R-68 as starter culture in cocoghurt production was investigated. To stimulate the growth of the two types of LAB, it was necessary to evaluate the addition of optimal skim milk and sucrose to produce cocoghurt to enable the product to meet food standard specifications.

Skim milk is good sources of protein for microbial growth, because it contains relatively high concentration of protein in addition to vitamins and minerals, prerequisites for the growth of LAB. Siadari (Siadari, 2007) stated that the addition of 15% skim milk produce a sweet potato probiotic drink that is highly preferred. This finding is in line with research conducted by Rasiyem (2004) using *Lactobacillus bulgaricus* and *Streptococcus thermophiles* and Pato *et al*., (2013) using starter of *Enterococcus faecalis* UP-11. Sucrose, a disaccharide also has the potential to be used as energy source for the growth of LAB. The present study was undertaken to evaluate the optimum skim milk and sucrose concentration required for the manufacture of cocoghurt to meet Indonesian yoghurt quality standards (National Standardization Agency of Indonesia, 2009).

MATERIALS AND METHODS

Treatments: The study was experimentally conducted using a Completely Randomized Design (CRD) with the treatments of variation of skim milk and sucrose. The treatments are as follows:

SKM 0 = Without addition skim milk (control)
SKM 2.5 = Addition of skim milk at 2.5% (w/v) of the volume of coconut milk
SKM 5.0 = Addition of skim milk at 5.0% (w/v) of the volume of coconut milk
SKM 7.5 = Addition of skim milk at 7.5% (w/v) of the volume of coconut milk
SKM 10.0 = Addition of skim milk at 10.0% (w/v) of the volume of coconut milk

SC 0 = Without addition sucrose (control)
SC 2.5 = Addition of sucrose at 2.5% (w/v) of the volume of coconut milk
SC 5.0 = Addition of sucrose at 5.0% (w/v) of the volume of coconut milk
SC 7.5 = Addition of sucrose at 7.5% (w/v) of the volume of coconut milk
SC 10.0 = Addition of sucrose at 10.0% (w/v) of the volume of coconut milk

Bacterial culture: *Lactobacillus casei* subsp. *casei* R-68 and *S. thermophylus* were each inoculated into tube containing 5 ml of MRS Broth media, and then incubated at 37°C for 24 hours in the incubator to obtain active culture.

Coconut Milk Preparation: The first step for the preparation of coconut milk was the peeling of coconut fruit followed by separation of the meat from the coconut shell. The coconut meat was then grated and squeezed directly using a machine. The pure coconut milk obtained was then filtered using a filter cloth to separate the pulp and other insoluble compounds from the milk.

Starter Preparation: The starter used was prepared in two steps; the first step was preparation of medium containing 5% skim milk and 2% sucrose. This medium was stirred evenly then put into glass jars and sterilized at 121ºC for 10 minutes. Following cooling 30-40ºC, the skim milk medium was inoculated with *L. casei* subsp. *casei* R-68 or *S. thermophylus* separately (2% v/v) and incubated at 37ºC for 13 hours. Following incubation, a second medium was made which consisted of equal volumes of skim milk and coconut milk. The mix was treated the same as the first medium, except that the bacteria were from 100% skim milk medium. The second medium was used as active starter in making cocoghurt.

The Cocoghurt Making Process: The formulation used in making cocogurt was as previously described by Ertanto *et al*., (2008). Coconut milk (400 ml) was mixed with sucrose 2% (v/w) and skim milk according to the treatments (0-10% of skim milk). The mixture was then homogenized using a blender for 5 minutes. The homogenized media were then heated at 85°C for 15 minutes, then cooled to a temperature of 37°C. The media were then inoculated with starter *L. casei* subsp. *casei* R-68 and *S. thermophylus* each (2.5% v/v) before being incubated at 37°C for 10 hours.

Parameters Measured in the Probiotic Cocoghurt: The cocoghurt parameters measured were pH, total lactic acid, total LAB, protein, fat, total solids, moisture and ash contents. The methods used were in accordance with Indonesia National Standard of Yoghurt (National Standardization Agency of Indonesia, 2009). pH was measured using a pH meter, while protein, ash, total solids, moisture and fat content were analyzed according to the method described by Sudarmadji *et al*., (1997). Total lactic acid was determined by alkalimetric titration using 0.1 N NaOH, and total LAB was calculated according to the method described by Fardiaz (1998). Fatty acid profiles were analyzed by gas chromatography (Seppanen-Laakso *et al*., 2002).

Data analysis: The data obtained were analyzed by analysis of variance (ANOVA). If the test results show that F count was greater than or equal to F table then further testing was performed using the Duncan New Multiple Range Test (DNMRT) at the level of 5% to determine the differences in each treatment.

RESULTS AND DISCUSSIONS

Figure 1 show that variations in the concentration of skim milk significantly affected pH, total lactic acid and total LAB of the probiotic cocoghurt. The data in Figure 1 shows that at higher concentrations of skim milk, the pH increased from pH 4.74 to 5.59 along with significant increase in the number of LAB. An increase in pH with percentage of skim milk added was observed. Rahman *et al.,* (1992) stated that the pH of skim milk ranged from 6.5 to 6.7. This high pH value contributed to the increase in cocoghurt pH as a result of the accumulation of skim milk that was not used by LAB for their growth. The results of the present study were in accordance with previous studies that reported an increase in the pH value of cocoghurt from 4.55 to 5.05 using the starter of *Enterococcus faecalis* UP-11 [14] and the pH of fermented milk from 4.85 to 5.45 using the starter *L casei* subsp. *casei* R-86 (2013). The increase in pH value should reduce total lactic acid content. However, in the current study, an increase in total lactic acid was observed (Figure 1). This increase was likely caused by the formation of lactic acid resulting from the decomposition of simple sugars such as lactose in skim milk and sucrose by LAB, which was found to increase in number during the 22 hours fermentation. According to USDEC (2005) the lactose content in skim milk is very high ranging from 49.5 to 52.0%. The amount of sucrose added to cocoghurt is quite small, 1%. Figure 1 also shows that total LAB was significantly higher in the treatment containing 10% skim milk. An increase in skim milk added also resulted in increased LAB. The increase in LAB in higher skim milk added group may be due to the availability of sufficient amounts of nutrients for the growth of both types of LAB used as starters. Overall the results confirmed that cocoghurt from all treatments met the requirements of probiotic yogurt and fermented milk, i.e. a minimum of 10^7 CFU/g (National Standardization Agency of Indonesia, 2009; CODEX STAN, 2003). In treatment SKM 0 (control), LAB was capable of growth even without the addition of skim milk. It is presumed that LAB could utilize simple sugars in the form of fructose and glucose in the coconut milk as an energy source to produce organic acids, especially lactic acid.

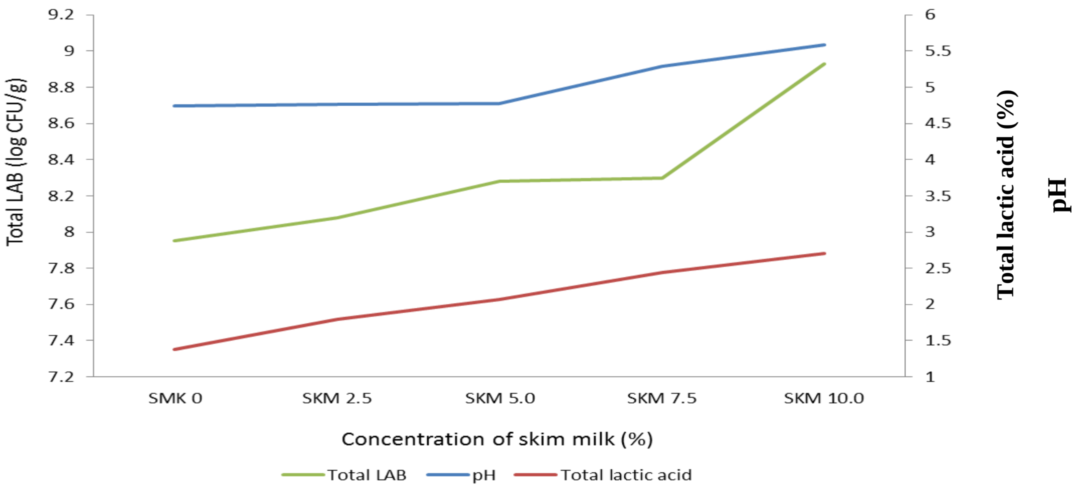

Figure 1. Variations in the concentration of skim milk on the pH, total lactic acid and total LAB of probiotic cocoghurt made by using the starter *Streptococcus thermophilus* and *Lactobacillus casei* subsp. *casei* R-68

Table 1 shows that variations in the concentration of skim milk used had a significant effect on the protein content in the probiotic cocoghurt produced, with concentrations of skim milk resulting in increased protein content in the probiotic cocoghurt obtained. This is likely due to the high protein content of skim milk. Both the Codex Stan 207-1999 and Reference Manual for U.S. Milk Powders (2005) state that the amount of protein in the skim milk is 34-37%. Protein content in cocoghurt in all treatments from this study has met the quality standard of yogurt which is at least 2.7% (National Standardization Agency of Indonesia, 2009).

Table 1 also shows that the higher the concentration of skim milk added, the more ash content in the probiotic cocoghurt produced. This is due the presence of minerals in skim milk. According to the USDEC (2005) the ash content of skim milk ranges from 8.2 to 6.8%, largely due to calcium (1.257 mg), magnesium (110 mg) and iron (0.32 mg) per 100 g skim milk. The results of this study are in accordance with the research of Pato *et al*., (2013). The permissible ash content allowed in yoghurt according to SNI 2981: 2009 is a maximum of 1.0%. Based on this standard, only SKM 0, SKM 2.5 and SKM 5.0 treatments meet the quality standard. The amount of skim milk added did not affect the moisture content of cocoghurt which ranged from 47.40-50.70%. According to Anugerah (2011), the moisture content of pure coconut milk was 54.9%. The concentration of skim milk also had less impact on the fat content of cocoghurt. The fat content in skim milk ranges from 0.6 to 1.25% (USDEC, 2005) with a maximum of 1.5% (CODEX STAN, 2003). The fat content of coconut milk is much higher resulting in a product ranging from 20.78-24.57%.

Table 1: Variations in the concentration of skim milk on the quality of probiotic cocoghurt made using *Streptococcus thermophilus* starter and *Lactobacillus casei* subsp. *casei* R-68

Treatments	Protein (%)	Fat (%)	Ash (%)	Moisture (%)	Total solid (%)
SKM 0 (without the addition of skim milk)	3.53[a]	20.78[a]	0.48[a]	50.70[a]	49.30[a]
SKM 2.5 (addition of skim milk 2.5%)	4.05[b]	23.77[a]	0.85[b]	50.30[a]	49.70[a]
SKM 5.0 (addition of skim milk 5.0%)	4.23[b]	23.82[a]	0.98[b]	50.29[a]	49.71[a]
SKM 7.5 (addition of skim milk 7.5%)	5.27[c]	23.87[a]	1.33[c]	48.12[a]	51.88[a]
SKM 10.0 (addition of skim milk 10.0%)	5.61[c]	24.57[a]	1.64[c]	47.40[a]	52.60[a]

Means followed by the lowercase letters in the same column indicated significant difference (p<0.05).

Overall the results showed that both types of LAB grew in the absence of skim milk (Figure 1, treatment SKM 0). This means that both LAB used as starters could use simple sugars such as sucrose added to the medium or simple sugars found in coconut milk as source of energy rather than from the lactose contained in skim milk. Therefore, the study was continued to determine the optimum amount of sucrose for the growth of LAB and the quality of cocoghurt. The results showed that the concentration of sucrose used significantly affectted (P <0.05) the pH, total lactic acid and total LAB of the cocoghurt (Figure 2).

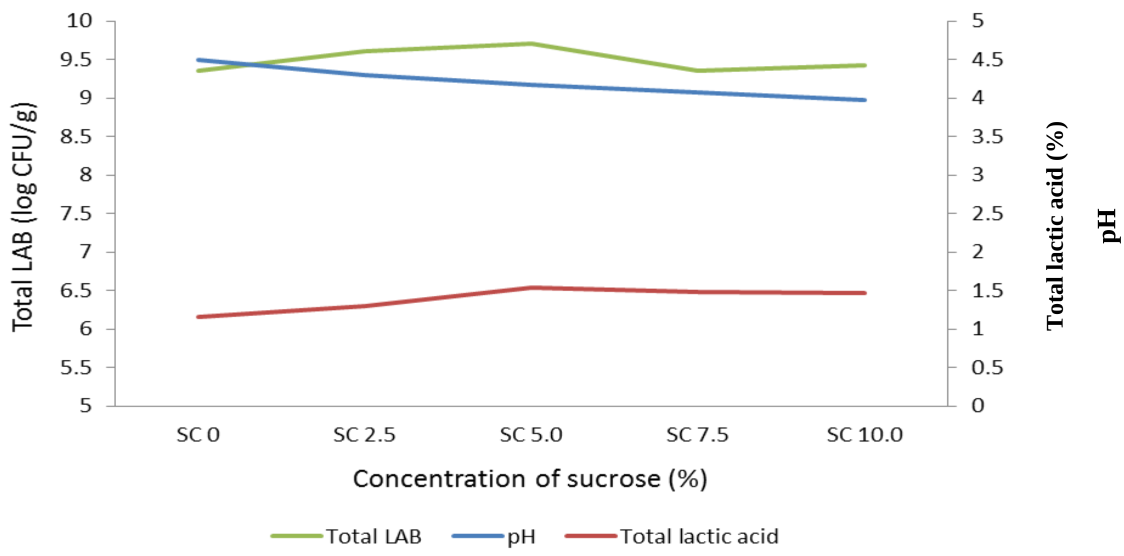

Figure 2. Variations in the concentration of sucrose on the pH, total lactic acid and total LAB of probiotic cocoghurt made by using the starter *Streptococcus thermophilus* and *Lactobacillus casei* subsp. *casei* R-68

The data in Figure 2 shows that the higher the concentration of sucrose used the lower the pH and the higher the total acid produced in the cocoghurt. This is probably since BAL was increasingly active in cell growth and division in the logarithmic phase using sucrose as an energy source which was widely available in the medium. The primary product produced from sucrose utilization was lactic acid which caused a decrease in the pH of cocoghurt. However, with a low pH value and accumulation of lactic acid, the LAB population significantly decreased, especially when the sucrose concentration used exceeded 5% (treatment SC 7.5 and SC 10.0, Figure 2). The number of LAB in this study ranged from 9.35-9.70 CFU/g using two starter cultures, *Lactobacillus casei* subsp. *casei* R-68 and *Streptococcus thermophilus*. These values were slike to those reported by

Syaputra *et al*., (2015) who stated values of 9.48-9.76 CFU/g using a single starter *Lactobacillus casei* subsp. *casei* R-68. The sucrose concentration used by Syaputra *et al.,* (2015) was higher, reaching 18%. They observed that high concentration of sucrose caused the pH to increase and total lactic acid to decreases. In the study, the use of high sucrose (> 5%) caused a decrease in the amount of LAB in cocoghurt. Phenomenon similar observation was reported in fermented milk made using a single starter *Lactobacillus casei* subsp. *casei* R-68 (Pato *et al*., 2017). High sugar concentration in the medium causes osmotic imbalance in cells leading to cell death (Fardiaz *et al*., 1980).

The variation in sucrose concentration used also significantly (P<0.05) influenced protein, fat, moisture and total solids contents, but not significantly affected the ash content of the cocoghurt produced (Table 2).

Table 2: Variations in the concentration of sucrose on the quality of probiotic cocoghurt made using *Streptococcus thermophilus* and *Lactobacillus casei* subsp. *casei* R-68

Treatments	Protein (%)	Fat (%)	Ash (%)	Moisture (%)	Total solid (%)
SC 0 (Without addition of sucrose)	4,63^{b}	31,62^{c}	0,89^{a}	49,47^{a}	50,53^{b}
SC 2.5 (Addition of sucrose 2.5%)	4.77^{d}	29.39^{bc}	0.78^{a}	50.61^{a}	45.08^{b}
SC 5.0 (Addition of sucrose 5.0%)	4.99^{cd}	24.24^{abc}	0.77^{a}	61.31^{b}	38.70^{a}
SC 7.5 (Addition of sucrose 7.5%)	4.77^{bc}	15.22^{ab}	0.91^{a}	54.92^{ab}	49.39^{ab}
SC 10.0 (Addition of sucrose 10.0%)	3.90^{a}	13.75^{a}	0.95^{a}	52.16^{a}	47.84^{b}

Means followed by the lowercase letters in the same column indicated significant difference (p<0.05).

The data in Table 2 shows an inverse relationship between the concentration of sucrose used and the levels of protein and fat contents in the cocoghurt. This was likely since increased sucrose concentrations resulted in inhibition of the growth of LAB (Figure 2), resulting in reduced in microbial fat, protein or lipoprotein. Protein, fat, ash and carbohydrates are compounds that form total solids in a product. Reduction in protein and fat contents of cocoghurt reduces the total solids of cocoghurt (Table 2). In this study, ash content did not influence changes in total solids as ash values did not vary significantly among treatments. The amount of ash in sucrose is very small (0.013%). Total solids were inversely proportional to moisture content. In this study, total solids decreased significantly as a result of decreased levels of protein and fat resulting in an increase in the moisture content of cocoghurt. Despite these variations, the quality parameters for all treatments met the yogurt quality standards, namely a minimum protein content of 2.7%; a standard fat content of at least 3% and a maximum standard ash content of 1.0% and a standard total BAL of at least 7.0 CFU/g (Figure 2, Table 2).

The variation of sucrose concentration used did significantly (P <0.05) impact taste, aroma and hedonic outcomes, but the effect on the color and texture was not significant (Table 3).

Table 3: Variations in the concentration of sucrose on the sensory quality of probiotic cocoghurt made using *Streptococcus thermophilus* and *Lactobacillus casei* subsp. *casei* R-68

Treatments	Descriptiive test				Hedonic test
	Colour	Taste	Aroma	Texture	
SC 0 (Without addition of sucrose)	3.57^{a}	4.00^{c}	3.80^{b}	2.60^{a}	2.77^{a}
SC 2.5 (Addition of sucrose 2.5%)	3.30^{a}	3.50^{b}	3.10^{a}	2.53^{a}	2.82^{ab}
SC 5.0 (Addition of sucrose 5.0%)	3.43^{a}	3.50^{b}	3.23^{a}	2.53^{a}	2.86^{abc}
SC 7.5 (Addition of sucrose 7.5%)	3.53^{a}	3.40^{b}	3.67^{b}	2.83^{a}	3.07^{c}
SC 10.0 (Addition of sucrose 10.0%)	3.17^{a}	2.90^{a}	3.10^{a}	2.53^{a}	3.03^{bc}

Means followed by the lowercase letters in the same column indicated significant difference (p<0.05).

The data in Table 3 shows that the colour of cocoghurt in all treatments was white. At increased concentrations of sucrose, the cocoghurt produced tasted both sour and sweet. The acid taste was caused by an increase in the amount of lactic acid formed during the fermentation process (Figure 2), while the sweetness originated from an increase in the amount of sucrose used. Cocoghurt in all treatments had a slightly coconut milk flavour. The dominant aroma of cocoghurt might be caused using pure coconut milk obtained from grated coconut which is immediately squeezed using a coconut milk squeezer without the addition of water during the preparation process. Methyl nonyl ketone compounds are thought to be the compounds that gave a distinctive aroma to the cocoghurt. Methyl nonyl ketone or 2-undecanone or IBI-246 with the molecular formula $C_{11}H_{22}O$ is found in coconut/palm kernel oil, soybean oil, rue oil (*Ruta graveolens*) and in some other essential oils, and also found in some fruits and agricultural products such as black currant, raspberry, black-berry peach, banana, clove, ginger, guava, straw-berry and wild tomatoes (Anonymous, 2018). Cocoghurt in all treatments of this study showed a thick texture. An increase in the amount of sucr-ose used has an unnatural effect on the texture of cocoghurt. The formation of the cocoghurt texture was determined by the condition of pH and protein content and not by the difference in suc-rose levels added. However, the effect of sucrose concentration contributes indirectly to the forma-tion of texture by providing a source of energy for microbes for metabolizing carbohydrates to pro-duce lactic acid. The pH and protein value of coc-oghurt did not vary greatly; for example, the pH ranged from 4.50 to 3.97 and the protein content ranged from 3.90 to 4.99%; as a result, only minor changes in taste and aroma was evident among treatments. The data in Table 5 also shows that cocoghurt made by adding 7.5% sucrose was pref-erred by panelists. This may be due to the sweet taste and reduced acidity. In the SC 0, SC 2.5 and SC 5.0 treatments, cocoghurt had an acidic and less sweet taste so it was preferred by panelists, while SC 10.0 treatment, cocoghurt had a sweet taste but is too acidic due to the total amount of lactic acid produced during the fermentation proc-ess (Figure 2) causing cocoghurt in treatment SC 10.0 not to be favored by panelists

Fat levels of cocoghurt (Table 4) were quite high, whereas the fatty acids that are responsible for the increased fat content in cocoghurt were mostly composed of medium chain saturated fatty acids, especially lauric acid and long chain unsat-urated fatty acids. Chain saturated fatty acids only amounted to 13.11%. Thus, consuming cocoghurt is expected to be beneficial for health for humans because it contains probiotic bacteria and lauric acid. The fat content in pure coconut milk is 35.0% (Anugrah, 2011). The results of the study show that the fat content exceeds the amount of fat in yogurt, which is generally a maximum of 3.0% (National Standardization Agency of Indo-nesia, 2009) and in regular yoghurt is 4.4% (Ano-nymous, 2012). Although the fat content in cocoghurt is quite high, the constituent fatty acids are mostly from medium chain fatty acids (MC-FA) which represents 72.90% of the total fat in cocoghurt (Table 4).

Table 4: Profiles of fatty acids of cocoghurt made by the addition of skim milk 5% and sucrose 5% using *Streptococcus thermophilus* starter and *Lactobacillus casei* subsp. *casei* R-68

Profiles of fatty acids	Content (%)
Saturated fatty acids	
Capliric acid	2.52
Capric acid	1.93
Lauric acid	13.86
Miristic acid	4.99
Pentadecanoic acid	ND
Palmitic acid	2.81
Stearic acid	1.30
Arachidic acid	0.02
Dodecanoic acid	0.01
Total saturated fatty acids	**27.44**
Unsaturated fatty acids	
Miristoleic acid	ND
Palmitoleic acid	0.002
Oleic acid	2.00
Linoleic acid	0.29
α-linolenic acid	ND
11-eicosanoic acid	0.01
Arachidonic acid	ND
EPA	ND
DHA	ND
Total unsaturated fatty acids	**2.30**
Unknown fatty acids	**0.05**
Total fatty acids	**29.79**

ND = Not detected

Medium chain fatty acids are readily metabolized by the body to produce energy and are not stored as body fats. Among the most common MCFA is lauric acid which reached 43.91%. Lauric acid has been used as an anti-bacterial, antiviral, anti-fun-gal and anti-microbial agent. Therefore, this coco-ghurt can also help improve the body's immune system against various diseases. The concentra-tion of long chain saturated fatty acids in cocog-hurt was relatively small, 13.11%. In addition, cocoghurt contains 7.28% unsaturated fatty acids consisting of palmitoleic acid, oleic acid, linoleic acid, 11-eicosanoic acid. Unsaturated fatty acids have a vital role in human health. The body has limitations in synthesizing unsaturated fatty acids that are double bonds of two or more such as linolenic fatty acids (omega-3) and linoleic fatty acids (omega-6).

These two fatty acids are therefore essential for humans. For adult's omega-3 has a special role, especially in the brain, central nervous system, and spinal cord. Nerve damage is caused by lack of these essential fatty acids (omega-3 and omega-6), causing premature senile dementia or memory loss in middle age and a drastic decline in brain function. For pregnant women, omega-3 plays a role in the development and nutritional needs of the fetus. Essential fatty acid consumption by pre-gnant women will have an impact on the fetal body weight and the size (length) of the body of the fetus it contains. Deficiency of essential fatty acids in early pregnancy can interfere with the health of placental development and consequently interfere with fetal and nerve development (Nettleton, 1993).

Conclusion

Based on the results of this study it can be concluded that the addition of skim milk at a concentration of 2.5% (w/v) and sucrose (5.0% w/v) using the starter cultures *Lactobacillus casei* subsp. *casei* R-68 and *Streptococcus thermophylus* can produce probiotic cocoghurt that meets quality standards (SNI 102981: 2009). The cocoghurt produced was slightly white with sour and sweet taste. The texture was rather thick and preferred by the panelists. Cocoghurt fat content exceeded quality standards but the profile of the fatty acids in cocoghurt was dominated by medium chain fatty acids (72.90%), especially lauric acid and long chain unsaturated fatty acids (7.28%) which have many beneficial effects on human health.

Acknowledgement

We thank the Institute for Research and Community Service, Universitas Riau, Ministry for Research, Technology and Higher Education of the Republic of Indonesia for the provision of research grant.

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