
Effect of Time Incubation To Quality and Organoleptics Soygurt

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Abstract. Soy is a source of vegetable protein that is recommended for consumption. One of the soybean ingredients known to the general public is soy milk. Soy milk is a health drink that has nutritional value equivalent to cow's milk. Utilization of soy milk is still limited because the flavor is less favored. To get a good taste can be processed through the process of fermentation by utilizing the bacteria *Streptococcus thermophilus* and *Lactobacillus bulgaricus* which will produce Soygurt. How long is the proper incubation time to produce soygurt at room temperature is unknown. The purpose of this research is to know the effect of incubation time on quality and organoleptic value of soygurt. This research is an experimental research with Completely Random Design 8 treatment, 3 replications. The treatments consisted of different incubation periods: 0 hours (control), 10 hours, 12.5 hours, 15 hours, 17.5 hours, 20 hours, 22.5 hours, 25 hours. Parameters measured were acidity, fat content, protein content and organoleptic value. The acidity data was analyzed by Anava. The results showed that the treatment given significant effect on acidity level. Levels of acidity, fat content, and protein content meet the Indonesian National Standard. For oorganoleptic test the highest score for color was on the 17,5 hour treatment and the viscosity was at 22,5 hours and 25 hours treatment. While for the favorite test is the treatment of 10 hours, 12.5 hours, 17.5 hours and 20 hours. The incubation time to affects the quality and value of the organoleptic soygurt.

Keyword: Length of incubation, Soybean Milk and Soygurt



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1. INTRODUCTION

Diversification of foodstuffs from nuts is restricted, whereas peanut seeds is a source of protein for most of the world's population, especially for people in developing countries like Indonesia. the pattern of society consumption shifts from eating high-cholesterol animal foods to consuming low-cholesterol vegetable foods.

Soybean is one source of vegetable protein, raw materials of tofu and tempe for the Indonesian. In addition to tofu and tempe other soybean processed products are soy extract known as soy milk (Yusmarini, 2004: 1)^[1]. Soy milk can be an alternative to overcome the problem of protein deficiency, especially in infants, children, and mothers who are breastfeeding (Suprapti, 2005: 7)^[2].

Soy milk is widely consumed as alternative milk to substitute cow's milk, has high protein content and relatively cheap price compared to other protein and has nutrient content that is not inferior to cow's milk, known as a health drink that contains no cholesterol, does not contain lactose, contains phytochemicals in the form of flavonoids so suitable to be consumed by lactose intolerance patients. Nevertheless, the utilization of soy milk is limited because the flavor is less favored (Cahyadi, 2007: 26-28)^[3].

The process of fermentation by utilizing lactic acid bacteria, will form organic acids that give a distinctive taste. Fermented soy milk using lactic acid bacteria will produce milk known as soygurt. Lactic acid bacteria used to produce soygurt are *Streptococcus thermophilus* and *Lactobacillus bulgaricus*, a microbe used in the manufacture of yogurt.

Carbohydrate content in soy milk is insufficient amount as a source of carbon and energy source for starter, therefore need the addition of sucrose as source energy and carbon source for starter (Yusmarini, 2004: 1-2)^[1].

Research shows yogurt produced from soy milk with the addition of 5% sucrose. The making stage is very simple by heating the soy milk in 90°C for 15-20 minutes, then chill at 43°C, then inoculated starter and in incubation so as to produce the desired soygurt (Wahyudi dan Sri Samsundari, 2008: 173)^[4].

According to Diki in Cahyadi (2007: 66)^[3], soygurt can be incubated at room temperature. Incubation is to place the culture of microorganisms in certain conditions, especially the right temperature for its growth. The length of incubation will affect the growth and activity of microorganism in the fermentation process. Growth and activity of microorganisms affect the amount of metabolites produced. Metabolite fermentation will affect the quality and value of organoleptik products.

Much of the literature (Yusmarini, 2004^[1] and Cahyadi, 2007)^[3] who wrote soygurt can be produced at incubation 3 hours, 5 hours, 12 hours and even 18 hours at 45°C and 37°C. from preliminary studies conducted soygurt perfectly formed when incubated over 5 hours at room temperature. The research was conducted with the aim of knowing the effect of incubation time on Quality and Value of Organoleptik Soygurt produced.

2. METHODE

The research was conducted in Microbiology Laboratory of Mathematics and Natural Sciences Faculty of State University of Padang and Research and Industrial Standardization Center (BARISTAND) Ulu Gadut Padang. Using a Completely Randomized Design (RAL) of eight different incubation time treatments with three replicates for acidity. The treatment provided is :

- A. Control (0 hours)
- B. Length of incubation 10 hours
- C. Length of incubation 12.5 hours
- D. Length of incubation 15 hours
- E. Length of incubation 17.5 hours
- F. Length of incubation 20 hours
- G. Length of incubation 22.5 hours
- H. Length of incubation 25 hours

Tools. Analytical scales, measuring cups, cup cups, Erlenmeyer, buret, thermometer, electric oven, spatula, spoon, dropper drip, jam jar, autoclave, refrigerator, bunsen, mikropipret, electric stove, pumpkin Kyeldhal, pumpkin distiller, strainer, fat pumpkin, soxlet, Laminar flow, protein distiller, fat extraction tool, desiccator.

Material. Soy milk, yogurt starter *Streptococcus thermophilus* and *Lactobacillus bulgaricus*, aluminum foil, plastic wrap, paper filter wrapper, phenolptalein, aquadest, neutral alcohol, 95% alcohol, mixed selen, brom cresol green 0.1%, red metal solution, 1% , boric acid H₃BO₃ 2%, HCL 0,1 N, NaOH 35%, fat solvent Petroleum benzene, HCL 25%, and KOH 0.1 N.

Parameters observed in this research include acidity, fat content, protein content, and organoleptic test.

2.1. Research Procedure

The starter was obtained from the University of Andalas Microbiology Laboratory in the form of bacterial culture of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* in cow milk medium. 50 ml of soy milk is heated for 15-20 minutes at 90°C, cooled to 43°C, then inoculated with 1.5 ml of starter and put into jar of jam, stirring evenly, cover with aluminum foil. Soy milk was incubated at room temperature for 0 hours (control); 10 hours ; 12.5 hours; 15 hours; 15 hours; 17.5 hours; 20 hours; 22.5 hours and 25 hours.

2.2. Acidity Test

Soygurt acidity is determined by titration method ^[10]. Samples of 5 grams are put into a cup glass, add 25 ml of neutral alcohol, add 2 drops of PP indicator, then titration with KOH 0.1 N until the pink is formed. Many ml KOH 0.1 N :

$$\text{Acidity (\%)} = \frac{\text{ml KOH} \times \text{N KOH} \times 0.009}{\text{gr of sample}} \times 100\%$$

2.3. Test Fat Content

Measurement of fat content is done by Weibull hydrolysis method ^[10]. Add 5-6 grams of sample to the cup, add 30 ml of HCL 25% and 20 ml of distilled water and a few stone stones to boil and simmer for 15 minutes. Strain in heat and wash with hot water so it does not react acid again. Insert a filter paper containing the fat sample into the wrinkle filter paper and dry it in the oven at a temperature of 100°C - 105°C.

Weigh the wrapping paper and its contents until the constant weight (W1) is obtained. Insert the filter paper wrap and its contents into soxhlet and extraction with petroleum benzene fat solvent for 6 hours at 80°C.

Distillated fat solvent and dry the fat extraction at a temperature of 100°C - 105°C. Cooled in desiccator and weigh up to constant weight (W2). Fat content is sought by the formula :

$$\text{Fat levels (\%)} = \frac{W1 - W2}{W} \times 100\%$$

2.4. Test protein Levels

Determination of protein content by Kjeldhal method ^[10] with the following procedure :

- a) A total of 0.5-0.6 grams of soygurt samples are fed into a 100 ml destruction flask and add 1 grain of mixed cement, add 15 ml of concentrated H₂SO₄, stir all komponent until evenly distributed. The mixture is burned above the flame in the fume hood, starting with a small flame, the burning is done until the solution is clear and greenish for ± 2 hours. Next chill in the acid cupboard, after cold dilute with aquadest in a 100 ml measuring flask and distillate it.
- b) Pour into a 50 ml filter flask of diluted sample solution, add 2 drops of PP indicator and aquades up to 300 ml volume and some boiling stones. The solution was made alkaline by adding 30 ml of 35% NaOH solution and the distillation result was accommodated in an ellipse filled with 25 ml of H₃BO₃ and 2 drops of brom cresol green indicator. The distillation is continued so that all the nitrogen and liquids that have been present in the distillers flask are captured by the H₃BO₃ present in the erlemenyer.

- c) The distillation is considered to be completed when 2/3 of the fluid in the distiller flask has evaporated or a small explosion occurs, then the distillation agent distilled 100 ml back with HCL 0.1 N (Y ml) until it forms a pink color as the end point marker.
- d) Do it on the blank paper by inserting 1 g of selenium in the destructive flask and adding 15 ml of sulfuric acid. Results of distillation blank dititer with HCL 0.1 N (Z ml), protein content can be searched with the formula :

$$\text{Protein levels (\%)} = \frac{(Y-Z) \times N \times 0,014 \times C \times 6,25}{X} \times 100\%$$

Note :

Y = The amount of HCL required for the titration of the sample

Z = The amount of HCL required for the blank titration

N = Normality of HCL = 0,1091

X = Example weight

C = Dilution factor 250/50

0,014 = Nitrogen

6,25 = Protein Factor

2.5 Organoleptic Test

To determine the level of consumer acceptance of the resulting soygurt products need to be tested organoleptik. The organoleptic test was performed based on Hedonij test with 15 panelists (Soekarto, 1985:78)^[5]. Each panelist is required to complete the questionnaire provided. Assessment of each parameter is scored with hedonic scale of less like, like, very like. Organoleptic assessment is done on color, viscosity, pleasure (aroma).

The acid content data were analyzed by using variance analysis with \sqrt{y} data transformation. If F arithmetic is greater than F table at 5% level it means there is a real difference, and further test is done (Hanafiah, 1991: 34)^[6]

Fat content, protein content and organoleptic descriptive analysis. The organoleptic test is processed based on the score given by the panelists on color, viscosity (consistency) and likes (aroma).

3. RESULTS

Table 1: Average acidity, fat content and soygart protein levels with different incubation times.

Incubation Time	Acidity (%)	Fat (%)	Protein (%)
B (10.0)	0.44 a	1.22	12.09
C (12.5)	0.60 a	1.79	7.42
D (15.0)	0.74 b	1.35	7.55
E (17.5)	0.83 b c	1.67	4.55
A (0.00)	0.88 b c	0.63	12.06
F (20.0)	0.92 b c	1.45	11.00
H (25.0)	0.97 c	1.06	17.95
G (22.5)	1.00 c	1.21	14.04

Description: The numbers followed by the same lowercase letters show no different real at the 5% level.

3.1. Soygurt Acidity

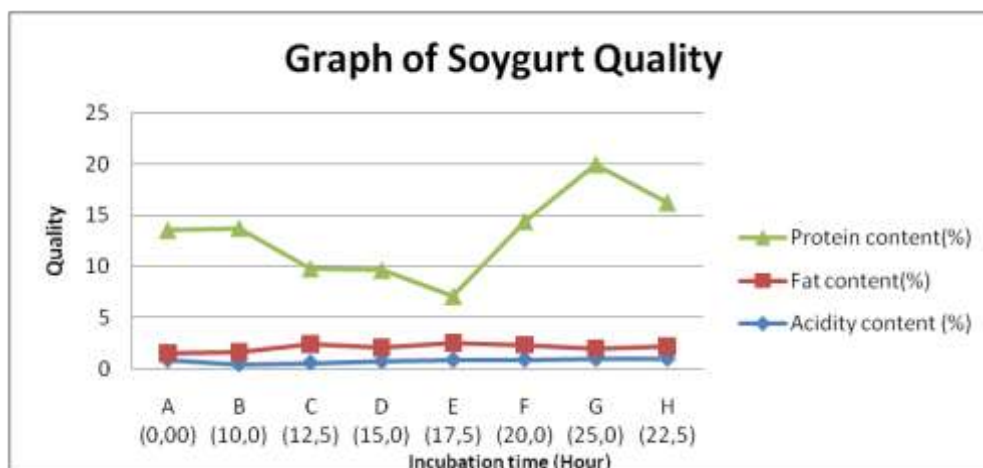
The result of the analysis of the variance to the acidity level showed different effect for each treatment, after a further test at the 5% level results as shown in Table 1. In the table above shows that soygurt acidity level on treatment B and C showed no different results. Treatment D (incubation 15 hours) to F treatment (incubation 20 hours) showed no significant difference although from the visible increase, but compared with treatment B (incubation 10 hours) and C (12.5 hours incubation) average acidity. At H (25-hour incubation) and G treatment (incubation 22.5 hours) showed no significant difference although there was a decrease in acidity

3.2. Soygurt Fat Content

The results of fat content of soygurt from different incubation periods ranged from 0.63% - 1.79%.

3.3. Soygurt Protein Levels

The results of soygurt protein content from different incubation periods ranged between 4.55% - 17.95%. For more details see the results of acidity, fat, and soygurt protein content from different incubation periods can be seen on the graph.



Based on the duration of incubation, it was observed that the highest average soygurt acidity of 1.00 was generated at G treatment (incubation 22.5 hours) and the lowest 0.44 was produced at treatment B (incubation 10 hours). For the lowest fat content of soygurt was 0.63% for the duration of incubation 0 hours and the highest soygurt fat content was 1.79% for the incubation time of 12.5 hours. As for the lowest levels of soygurt protein is the incubation of 17.5 hours of 4.55% and the highest incubation is 25 hours of 17.95%.

3.4. Results of the Organoleptic

The average results of the organoleptic assessment of the color, viscosity, consistency and preferences of each treatment can be seen in Table 2.

Table 2 : Average number of organoleptic test scores (color, viscosity, preference)
Soygurt from each treatment.

Parameter	Incubation Treatment (Hour)							
	0	10	12,5	15	17,5	20	22,5	25
Color	37	32	31	31	34	32	30	26
Viscosity	22	30	26	29	28	29	33	33
Preference	31	34	34	27	34	34	26	31

From the results obtained scores for each treatment ranged from 31-37, meaning that all panelists assess the white color for the resulting soygurt and on the incubation treatment 25 hours of panelists to assess the color yellow.

Outcome in this reseach attained the score for the viscosity of each treatment ranged from 22-33, meaning that all the reviewers rated moderate viscosity for the

resulting soygurt and 22.5 hours of incubation treatment and 25 hours of panelists considered thick viscosity.

Resultant scores for each treatment ranged between 26-34, meaning that all panelists assess the fondness emphasized on the aroma is very like for the resulting soygurt and the incubation treatment of 15 hours and 22.5 hours of the panelist rate is for the likes (aroma).

Assessment Score

- a. Color : (1-15) Yellow, (16-30) Yellowish, and (31-45) White
- b. Viscosity : (1-15) Less (dilute), (16-30) Medium, and (31-45) Condensed
- c. Preferences: (1-15) Less, (16-30) Medium, and (31-45) Really like

4. DISCUSSION

Levels of soygurt acidity resulting from different incubation times showed that the incubation time of 0 hours to 25 hours increased and decreased the resulting soygurt acidity. As shown in the curve, where the incubation of 0 hours resulted in acidity levels higher than the incubation acidity of 10 hours to 17.5 hours incubation, this is because the soygurt is made from yogurt starter whose medium is cow's milk.

Decreased levels of soygurt acidity occurs because soygurt microbes still adapt to changes in the medium of cow's milk in the starter to soy milk in the fermentation medium and its growth environment. Fardiaz (1992:99)^[7] cells placed in the same medium as the previous environment may not require adaptation time, but if the medium is different from the previous environment it will take adaptation time to synthesize the enzymes needed for metabolism.

At incubation of 12.5 hours until incubation of 22.5 hours there was an increase in soygurt acidity Suriasih (2003:1)^[8] length of incubation time

then there will be accumulation of lactic acid that causes increased acidity of soygurt. Increased soygurt acidity occurs because soygurt microbes have growth phase. According to Fardiaz (1992:100)^[7] in the microbial growth phase splits rapidly, in this phase the growth rate is influenced by the growing medium such as nutrient content and also stable environmental conditions including temperature and humidity. Availability of sufficient nutrient sources and stable environmental conditions will cause microbes to multiply and microbn numbers increase.

Increasing the amount of microbes increases the amount of lactic acid. In incubation 22.5 hours and 25 hours incubation showed less than a few hsils and after a

further test showed no significant difference. Probably at 22.5 h of incubation and 25 h microbial incubation is still in the growth phase.

Rahayu (1989:261)^[9] says lactic acid is formed from pyruvic acid produced from the path of glycolysis. Pyruvic acid is converted to lactic acid by lactate dehydrogenase enzyme secreted by *S. thermophilus* and *L. bulgaricus*. In addition to lactic acid, other organic acids are also produced and give a distinctive aroma. Based on the Indonesian National Standard the total of soygurt acid ranges from 0.5% -2.0% and from the results of research on soygurt acidity level data obtained acidity levels are still in the range.

The results of observations on the fat content that can be seen in Table 2. From the results of different studies of different incubation is seen that the content of fat soygurt obtained did not affect the amount of fat content. Lipolytic activity of soygurt-forming bacteria is not so great (Rahayu, 1989: 328)^[9]. According to Chandan and Shahani (1993 dalam Yusmarini, 2004: 4)^[1] fat hydrolysis contributes little to soygurt products. Based on the Indonesian National Standard, maximum soygurt fat content is 3.8% and the result of the study meets the Indonesian National Standard, where the fat content is below 3.8%.

Soygurt function is wrong stunya is mecegah coronary heart disease by lowering cholesterol levels in blood, it means high fat content will be able to cause cholesterol level in high blood. So in the Indonesian National Standard soygurt fat content is the maximum is 3.8% and if the levels exceed will give a bad impact for health.

The results of observations on soygurt protein levels were seen in Table 2. From the results of the study there was a change in soygurt protein content in different incubation periods. Such as terlihat on the curve of soygurt protein content in incubation 0 hours and 10 hours higher than other treatments, this is because the starting starter in the medium of cow milk that already has enough protein content and join the protein in soybean milk that has not been much hidrolized by microbes.

In incubation 12.5 hours to 17.5 hours there is a decrease and increased levels of soygurt protein, this is because soygurt microbes in the adaptation phase of changes in the medium and growth environment, from the environment of starter with the medium of cow milk to soy milk medium in soygurt making. If microbes are able to adapt then the number of microbes that grow in soygurt will multiply followed by increased levels of protein.

Otherwise, if the microbes are not able to adapt the microbes will die and not able to move that causes decreased levels of protein. In the incubation of 17.5 hours to 25 hours there continues to be an increase in protein levels because of the amount of microbes that are able to adapt in more medium and microbial activity increases followed by increased levels of soygurt protein. Hembing (1998, Suprapti 2005: 33) states that soy

milk protein content is 4.10 g, after fermentation with lactic acid microbes that produce soygurt there is an increase in the amount of protein.

Yusmarini(2004: 4) said the increase in the amount of protein from soygurt due to the addition of microbial protein used as a starter. The more number of microbes contained in soygurt, the higher the protein content because most of the components of microbial compilers ranged between 60% -70%. Soygurt that has a good nutritional content is a soygurt that has high protein levels so good for health. Based on Indonesian National Standard, soygur protein content is at least 3.5%. From the results of the study, soygurt protein content produced above 3.5% and meet the Indonesian National Standard.

The results of organoleptic test conducted on the color, viscosity and aroma of each treatment can be seen in Table 2. From the test results showed that soygurt has color, viscosity and varied preferences. For color tests almost all of the soygurt is considered white by the panelists. At the time of this organoleptic test there is no comparable color that is completely white. Actually the color of yellowish white soygurt, Yusmarini (2004:5) soybean to make soy milk mostly yellow so milk and soygurt produced yellowish white.

In addition, the content of Riboflavin (vitamin B2) also causes the color of milk and soygurt become yellowish as proposed by Winarno (1988 in Yusmarini, 2004:5), riboflavin can give the color of fat in milk to yellowish, therefore the use of bacteria in producing soygurt does not affect the color of soygurt. So during the fermentation does not happen coloring material in soy milk.

For viscosity tests almost all of the soygurtes assessed by the panelists had moderate degree of viscosity, only 22.5 hours and 25 hours of incubation treatment showed a high viscosity (thickness). The viscosity of soygurt occurs due to the accumulation of lactic acid that coagulates the protein so it is semi solid. Supposedly longer incubation of thick soygurt semut is produced.

Agree whith Hidayat (2006: 146) that soygurt there is a thick structure (Firm soygurt) until semi-solid (Stirred soygurt) in accordance with the Indonesian National Standard and the soygurt structure is dilute called Drinking soygurt. From the research objectives and assessments of soygurt panelists obtained have a dilute structure (Drinking soygurt) while 22.5 hours of incubation and 25 hours of soygurt that has the structure of the kenta (Firm soygurt).

For the favorite test is emphasized on the scent almost all the panelists said that they liked the smell of soygurt tested and less like on soygurt with incubation treatment 15 and 22.5 hours. Aroma of acids in accordance with the Indonesian National Standard

which favored the panelists, because the soygurt-forming bacteria produce lactic acids and typical and organic acids can not improve taste and that is not too acid.

The resulting soygurt acidic aroma is not very acidic, Yusmarini (2004:5) said the fermentation of soygurt by using sucrose is not too surprisingly soygurt with high acidity because sucrose is not the main source of carbon for lactic acid bacteria used in the manufacture of soygurt, so the organic acids produced are not too much.

5. CONCLUSION

The incubation time gives a noticeable effect on the acidity, where the resulting acidity increases. Levels of protein, fat content and soygurt acidity levels are produced to meet the Indonesian National Standard. The organoleptic test for the color, viscosity and the pleasures of soygurt with good organoleptic quality and value is with 25 hours incubation time.

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