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Characteristics Physicals and Chemicals of Probiotic Drinks Soy-Yamghurt

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Abstract. Soy-yamghurt is fermentation product of yam-bean extract and soybean extract made by adding bacterium Lactobacillus bulgaricus, Lactobacillus acidophilus and Streptococcus thermophillus which are commonly used in the process of making yoghurt. This study aims to determine the physical and chemical characteristics of soy-yamghurt probiotic drinks. The research used a completely randomized design factorial with two factors, i.e.: ratio of yam-bean extract with soybean extract (100%:0%; 75%:25%; 50%:50%; 25%:75%; 0%:100%) and fermentation periods (4 hours; 6 hours; 8 hours). The result showed that ratio of yam-bean extract with soybean extract had highly significant effect on color test value, viscosity, moisture content, protein content, total sugar content, reducing sugar content, starch content, and glucose content. In the meantime, the fermentation periods had highly significant effect on viscosity, moisture content, total sugar content, reducing sugar content, starch content, glucose content and had significant effect on color and protein content. Interaction between the two factors had a highly significant effect on viscosity, reducing sugar content and had significant effect on moisture content. Furthermore, the interaction had no significant effect on color, protein content, total sugar content, starch content, and glucose content. The best soy-yamghurt was produced with ratio of yam-bean with soybean extract 50:50 fermented for 6 hours.

Keywords: fermentation periods, probiotik drinks, soybean, soy-yamghurt, yam-bean

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1. Introduction

Lactic acid bacteria are generally widely used in the fermentation industry, now widely used in the health sector as probiotics. Probiotics are bacteria that live in foods such as yogurt and soyghurt, if eaten in sufficient quantities, which can be beneficial and improve the health of body materials, while prebiotics are foods that cannot be digested but which can effectively trigger the growth of beneficial microorganisms in the digestive tract. Prebiotics that are widely known and used are oligosaccharides consisting of raffinose, stakiose, fructo oligosaccharides, inulin and lactulose [1]. Synbiotics are a combination of probiotics and prebiotics that provide a beneficial

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effect on the host by keeping food supplements in the digestive tract triggered by microbes to promote growth and or activate metabolism to improve life [2].

Yogurt is a functional food that is consumed by many people because of its delicious taste, high antioxidant activity and good nutritional content. Yogurt is a good source of vitamin B2 and minerals for the body. Yogurt has also been shown to have benefits in overcoming gastrointestinal disorders and preventing cancer [3]. soyghurt is a fermented product of soybean juice that uses lactic acid bacteria, namely Streptococcus thermophillus and Lactobacillus bulgaricus, which are commonly used in the process of making yogurt [4]. Soyghurt processing aims to increase the nutritional value of soybean juice, because in the fermentation process it produces lactic acid bacteria that are useful for balancing the digestive system microbiota, lowering total cholesterol levels, accumulation of liver triglycerides in the process of oxidative stress, preventing cancer, fungal and bacterial infections [5].

Yam-bean has been shown to have strong antioxidant activity, as well as to contain water-soluble polysaccharides (PLA), known as fructo oligosaccharides or inulin [6]. Inulin cannot be digested by the human body but is soluble in water. Properties like this are very useful for diabetics orpeople on low-calorie diets. The presence of isoflavones and PLA in yam and the content of soybean isoflavones add to the prestige of bengkoang and soybeans as plants that are nutritious for health. Water-soluble polysaccharides of yam is useful for the health of flora that live in the intestines such as Lactobacillus sp. [6], [7]. The utilization of yam tubers and soybeans in the form of probiotic drinks has not been widely explored, this can provide scientific information to the public and researchers about fermented ingredients for health. This study aims to determine the physical and chemical characteristics of soy-yamghurt probiotic drinks.

2. Material and Methods

The materials used in this research were commercial yogurt containing Lactobacillus bulgaricus, Lactobacillus acidophilus and Streptococcus thermophillus, yellow soybeans, yam-bean and milk powder, obtained from a supermarket in the city of Medan. The chemicals used in the study were gom arabic, NaHCO3, aquadest, Na-2,6-dichlorophenol salt, H2SO4 0,325 N, NaOH 1,25N, 70% alcohol, 96% alcohol, hexane and NaOH 40%.

2.1. Primary Culture Preparation

To prepare the primary culture, milk powder 16% and sugar 3% were dissolved with 200 ml of hot water (80oC). Then, the temperature was lowered to 45°C. Commercial yogurt 5% was added from the mixture volume and stirred. It is incubated at a temperature of 40-45°C for 7 hours. After that, rejuvenation was done 3 times and stored in the refrigerator.

2.2. Yam Bean Extract Production

Yam bean fresh 5-month-old was sorted and washed, then blanched at 80oC for 10 minutes. The yam bean was then peeled, cut into small pieces and mixed with cold boiled water with a ratio of 1: 1 yam-bean and water. Finally, the mixture was filtered to obtain yam-bean extract.

2.3. Soybean Extract Production

Soybeans were sorted and washed thoroughly. Then, the washed soybeans were immersed in 0.5% NaHCO3 (sodium bicarbonate) solution for 30 minutes, after which they were drained. Soybeans were boiled for 30 minutes, then they were removed and drained. Soybean skin was then separated by kneading and washed with water many times until the skin is easy to separate. The soybeans were ground by adding 6 parts of hot water. Soybean porridge was filtered with filter cloth, then the soybean extract was heated to boiling. After boiling, soybean extract was left on low heat (80oC) for 20 minutes.

2.4. Soy-yamghurt Probiotic Drinks Production

Yam-bean extract and soybean extract were mixed according to the treatment with a ratio of yam-bean extract with soybean extract, namely S1= 100 %:0 %, S2= 75 %:25 %, S3= 50%:50 %, S4= 25 %:75 %, S5= 0 %:100 %. Then, the mixture of yam-bean and soybean extracts were pasteurized at 80oC for 30 minutes.

Skim milk powder 15% and sugar 3% were dissolved with 200 ml of mixture of yam-bean extract and soybean extract according to the treatment, then added gum Arabic 0.6%. Then, the temperature was lowered to 45°C. Commercial yogurt 5% was added from the mixture volume and stirred. It is incubated at a temperature of 40-45°C with fermentation period according to the treatment, H1= 4 hours, H2= 6 hours, H3= 8 hours. After the frementation was finished, soy-yamghurt was stored in a refrigerator at 7-10oC for 7 days before the analysis.

2.5. Observation

Determination of moisture and protein contents were carried out based on AOAC [8] with a modified oven and using the Kjeldahl method, respectively. Viscosity was analysed based on [9] with a modified falling ball method. Determination of viscosity was carried out by the principle of how long the speed of the ball falling in the sample solution is influenced by the earth's gravity. Color measurement was determined by using the Hunter method, with a minolta chromameter (type CR 200, Japan) [10]. Determination of total sugar content was carried out based on [11]. Determination of reduced sugar content is based on [12], the principle of this method is that in an alkaline environment, reducing sugar will reduce 3,5-dinitrolylate (DNS) to form a compound whose absorbance can be measured at a wavelength of 550 nm. Determination of starch content was carried out based on [12]. Determination of glucose content is based on [13].

3. Results and Discussion

3.1 Characteristics Physicals of Probiotic Drinks Soy-Yamghurt

The physical characteristics of soy-yamghurt observed in this study included color with L*, b*, a* values, which were analyzed based on the chromameter and viscosity using the falling ball method.

3.1.1. Color

Color analysis of soy-yamghurt probiotic drink using color reader instrument. The parameters to be read are L*, b*, and a*. The L* value is expressed as the brightness level with a value of 0 for black (dark) and 100 for white (light). The b* value indicates the intensity of the yellow (+) and blue (-) colors, the a* value indicates the red (+) and green (-) color intensity. The effect of ratio of yam-bean extract with soybean extract and fermentation period on color with L*, b*, a* values of soy-yamghurt probiotic drinks is shown in Table 1 and Table 2.

Table 1. The Effect Ratio of Yam-bean Extract with Soybean Extract on Color of Probiotic Drinks Soy-yamghurt

ratio yam-bean extract with soybean extract	Color		
	a	b	L
S1 = 100:0	-9.931cC	18.256aA	92.648aA
S2 = 75:25	-8.773aA	18.256bB	90.648bB
S3 = 50:50	-9.057bB	18.534bB	90.970bB
S4 = 25:75	-8.904abA	19.087bB	90.756bB
S5 = 0:100	-8.653aA	19.793aA	91.137aA

Notes: The data is the average of 3 replications. Numbers followed by lowercase letters indicate significant (P<0.05) and uppercase letters indicate highly significant (P<0.01) with the LSR test

Table 1 shows that the treatment that has the highest brightness value was S1 (100% : 0%) which was 92.648. The color (L*) value indicates the brightness of soy-yamghurt probiotic drinks, the higher the color (L*) value the brightness the color of soy-yamghurt probiotic drinks. Soy-yamghurt probiotic drinks brightness was influenced by the ratio of yam-bean extract with soybean extract in the mixture, in which, the higher the ratio of the yam-bean extract added, the soy-yamghurt probiotic drinks produced had a brightness color, while the higher percentage of soybean extract was added, the soy-yamghurt probiotic becomes darker.

The color (b*) value (yellow) was carried out to determine the color change of b* (yellow) in the soy-yamghurt probiotic drink. The color (b*) value indicates that the treatment that has the highest value is S5 (0% : 100%) which is 19.793. The higher the amount of soybean extract added, the yellower the color (b*) value of the soy-yamghurt probiotic drink produced caused by raw materials the main ingredient is yellow soybean extract so that the resulting soy-yamghurt become yellowish white. In addition, color soy-yamghurt can also be caused by addition of ingredients such as sucrose and milk. Content vitamin B2 (riboflavin) in milk too causes the color of soy-

yamgurt become yellowish. According to [14], that riboflavin can gives fat color to milk yellowish.

The color (a*) value is in the range (-9.931) - (-8.653), The soy-yamghurt product from yam-bean extract and soybean extract is greenish yellow as indicated by the color (a*) value (-) green. The greenish color indicates the color of the flavonoids, the formation of green or blue green color indicates the presence of flavonoid compounds in the product [15].

Table 2. The Effect of Fermentation Period on Color of Probiotic Drinks Soy-yamghurt

Fermentation period	Color		
	a	b	L
H1 = 4 Hours	-9.12c	18.949b	90.981c
H2 = 6 Hours	-9.065b	19.048b	91.029b
H3 = 8 Hours	-9.006a	19.853a	91.659a

Notes: The data is the average of 3 replications. Numbers followed by lowercase letters indicate significant (P<0.05)

Table 2 shows that the longer the fermentation period, increased the color (L*) value and color (b*) value. Color (L*) value was carried out for determine the color of L* (brightness) in soy-yamghurt probiotic drink during fermentation. The increase in brightness is thought to be due to during fermentation, lactic acid is formed due to LAB activity, and the amount increased with increasing fermentation period. According to [16], this is caused by a decrease in pH which will increase the brightness of lactic acid fermented drinks. According to [17], stated that the increase in the brightness level (L*) was due to the longer the fermentation period, the more yellowish-white color of the milk would be formed and perfectly dispersed so that the color of the fermented drink is getting brighter.

Color b* (yellow) value was carried out for determine the color change of b* (yellow) in soy-yamghurt probiotic drink during fermentation. The increase color (b*) value It is suspected that during the fermentation process the bacterial activity increases to form a coagulum. The coagulum formed from skim milk and sucrose is yellowish white in color [14].

Color a* (green) value was carried out for determine the color change of a* (green) in soy-yamghurt probiotic drink during fermentation. The greenish color indicates the color of the flavonoids, the formation of green or blue green color indicates the presence of flavonoid compounds in the product [15].

3.2 Viscosity

The interaction between the ratio of yam-bean extract with soybean extract and fermentation period showed highly significant effect (P<0.01) on viscosity of the soy-yamghurt probiotic drinks. The effect of ratio of yam-bean extract with soybean extract and fermentation period is shown in Figure 1.

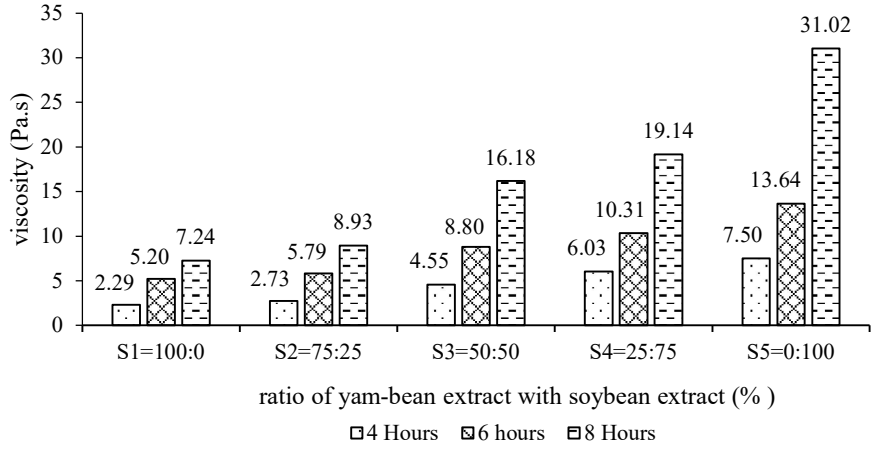

Figure 1. The Effect of Ratio of Yam-bean Extract with Soybean Extract and Fermentation Period on Viscosity of the Soy-yoghurt Probiotic Drinks

Figure 1 shows that treatment of S5H3 soy-yamghurt probiotic drinks with 100% soybean extract and 8 hours fermentation period had the highest viscosity from all treatment which was 31.02%, while the treatment with result of the lowest viscosity was S1H1 treatment with 100% yam-bean extract and 4 hours fermentation period was at 2.29%. The more soybean extract is added, the thicker was the viscosity, because soybean extract contains a lot of protein which during fermentation occurs clumping due to the formation of lactic acid (reaches the protein isoelectric point). The longer the fermentation period, the thicker the soy-yamghurt viscosity, this is because the more lactic acid bacteria are formed, the faster the isoelectric point is reached and the faster the protein clumping. Viscosity is obtained from the coagulation of milk casein due to the low acidity due to the work of bacterial culture [18].

Incubation time for each treatment can also affect yogurt viscosity, in which the longer the incubation period, the higher the viscosity of yogurt. According to [19] the increase in viscosity during storage was caused by changes in milk protein, especially casein which is hydrophilic. The difference in the viscosity level is caused by the total solids contained in each product and also the difference in acidity and pH value, because both play a role in the clumping of casein and protein. Viscosity can be used as an index of the amount of solids contained in a liquid, the more the amount of solids, the greater the viscosity in the liquid [20].

3.2. Characteristics Chemicals of Probiotic Drinks Soy-Yamghurt

The chemicals characteristics of soy-yamghurt observed in this study included moisture content, protein content, total sugar content, reducing sugar content, starch content and glucose content.

3.2.1. Moisture content

The interaction between the ratio of yam-bean extract with soybean extract and fermentation period showed a significant effect ($P<0.05$) on moisture content of the soy-yamghurt probiotic

drinks. The effect of ratio of yam-bean extract with soybean extract and fermentation period is shown in Figure 2.

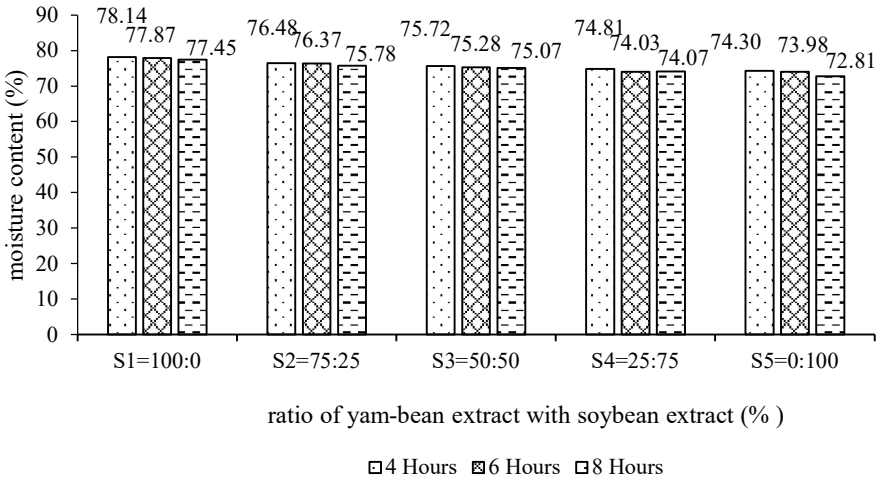

Figure 2. The Effect of Ratio of Yam-bean Extract with Soybean Extract and Fermentation Period on Moisture Content of the Soy-yoghurt Probiotic Drinks

Figure 2 shows that treatment of S1H1 soy-yamghurt probiotic drinks with 100% yam-bean extract and 4 hours fermentation period had the highest moisture content from all treatment which was 78.14%, while the treatment with result of the lowest moisture content was S5H3 treatment with 100% soybean extract and 8 hours fermentation period was at 72.81%. The higher amount of soybean extract added and the longer the fermentation period, the moisture content of soy-yamghurt probiotic drinks produced was decreased. This is because the drying process is influenced by several factors, one of which is the initial moisture content of the material. The moisture content in yam-bean is higher or more than the moisture content in soybeans which is less. According to [21] one of factors that affect drying related to the nature of the material is the initial moisture content. Yam-bean is a tuber that contains a fairly high moisture content, The main ingredients of yam are water and fiber, which is 85 g per 100 g of material [22]. The moisture content of soybean is 7.5 g per 100 g of material [23].

During fermentation, the water content of the resulting soy-yamghurt is lower, because during the fermentation process there is a reshuffle of compounds that are not soluble in water into compounds that are soluble in water so that the longer the fermentation, the more water-soluble compounds formed, which will increase the volume of water that evaporates in the drying process, and this may also be because less water is used for the growth of lactic acid bacteria. According to [14] which states that soyghurt generally contains about 85 to 89% water.

3.2.2. Protein content

The interaction between the ratio of yam-bean extract with soybean extract and fermentation period gave no significant effect ($P>0.05$) on the protein content of soy-yamghurt, but each

treatment factor provides highly significant (P<0.01) for ratio of yam-bean extract with soybean extract and significant effect (P<0.05) for fermentation period on the protein content. The effect of ratio of yam-bean extract with soybean extract and fermentation period on protein content can be seen in Figure 3 and Figure 4, respectively.

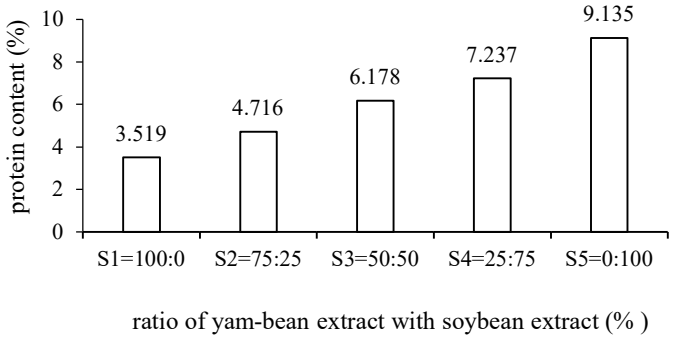

Figure 3. The Effect of Ratio Yam-bean Extract with Soybean Extract on Protein Content of Soy-yamghurt Probiotic Drinks

Figure 3 shows that the treatment with the highest protein content was S5 (0%:100%) treatment at 9.135% and the lowest protein content was treatment S1 (100%: 0%) at 3.519%. The higher amount of soybean extract added, the protein content of soy-yamghurt probiotic drinks produced was increased, it was because soy-yamghurt is a source of protein, both derived from soy and milk powder, which can contribute to increasing protein levels in soy-yamghurt. The nutritional composition of soyghurt is similar to yoghurt, according to the yogurt quality standard in SNI 01-2981-2009, the minimum protein content in yogurt is 2.7%, so it can be said that the protein content soyghurt is higher than the SNI standard, including the content of vitamin B complex, calcium and protein. During the yoghurt fermentation process, there is a synthesis of B-complex vitamins, especially vitamin B1 (thiamin), vitamin B2 (riboflavin), antioxidants daidzein, genestein, glycitein, basitracin, and several essential amino acids that make up protein [24].

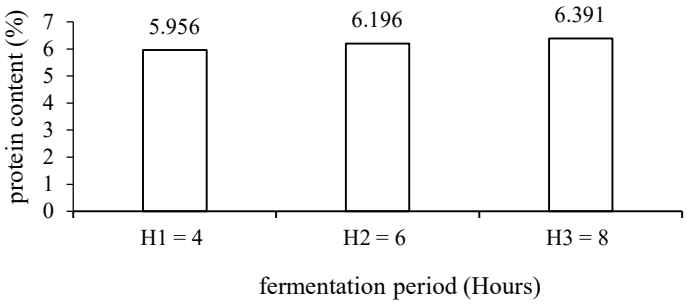

Figure 4. The Effect of Fermentation Period on Protein Content Soy-yamghurt Probiotic Drinks

Figure 4 shows that the treatment with the highest protein content was H3 (8 Hours) treatment at 6.391% and the lowest protein content was treatment H1 (4 Hours) at 5.956%. The longer the fermentation period, increased the protein content, it was because during fermentation there is an overhaul of macro components, especially sugars into simpler components, so that free protein

increases during fermentation, leading to the increase of protein in soy-yamghurt. In addition, several essential amino acids that make up protein are histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valineformed from the cell mass of lactic acid bacteria during the fermentation process [24].

3.2.3. Total sugar content

The interaction between the ratio of yam-bean extract with soybean extract and fermentation period gave no significant effect ($P>0.05$) on the total sugar content of soy-yamghurt, but each treatment factor provides a highly significant effect ($P<0.01$) on the total sugar content. The effect of ratio of yam-bean extract with soybean extract and fermentation period on total sugar content can be seen in Figure 5 and Figure 6, respectively.

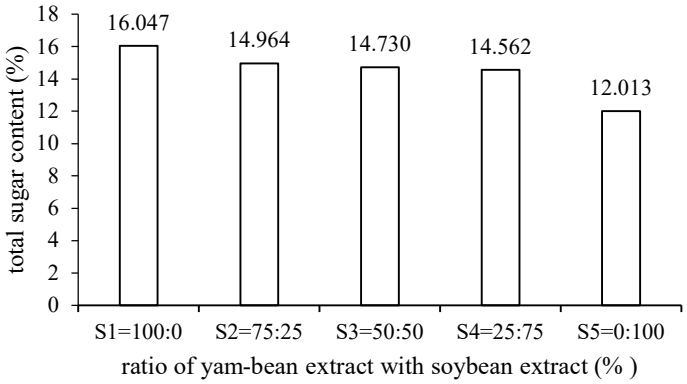

Figure 5. The Effect of Ratio Yam-bean Extract with Soybean Extract on Total Sugar Content of Soy-yamghurt Probiotic Drinks

Figure 5 shows that the treatment with the highest total sugar content was S1 (100%:0%) treatment at 16.047% and the lowest total sugar content was treatment S5 (0%: 100%) at 12.013%. The higher amount of soybean extract added, the total sugar content of soy-yamghurt probiotic drinks produced was decreased, because the suspected that the less amount of yam-bean extract causes relatively little glucose to dissolve in water so that less glucose is utilized by lactic acid bacteria for metabolic processes and growth of lactic acid bacteria. Lactic acid bacteria as a candidate for probiotic bacteria are microorganisms that are safe to add to food because they are non-toxic and do not produce toxins (food grade microorganisms) or Generally Recognized as Safe (GRAS), which are microorganisms that are not at risk to health. Lactic acid bacteria are Gram-positive rods or spherical, non-spore-forming bacteria, which are generally facultative anaerobes. The lactic acid bacterial genera that have long been used as probiotic candidates are Lactobacillus, Lactococcus, Leuconostoc, Pediococcus, and Streptococcus as well as the Bifidobacterium genus [2].

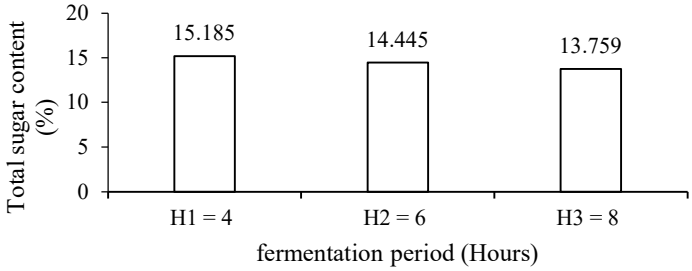

Figure 6. The Effect of Fermentation Period on Total Sugar Content Soy-yamghurt Probiotic Drinks

Figure 6 shows that the treatment with the highest total sugar content was H1 (4 Hours) treatment at 15.185% and the lowest total sugar content was treatment H3 (8 Hours) at 13.759%. The longer the fermentation period, decreased the total sugar content because the length of fermentation will affect how much sugar is converted into lactic acid using sugar as the metabolism of lactic acid bacteria. Lactic acid bacteria utilize sugar as a source of energy, growth, and produce secondary metabolites in the form of lactic acid during the fermentation process. The more lactic acid bacterial cells are formed, the more glucose will be used for cell metabolism [25].

3.2.4. Reducing sugar content

The interaction between the ratio of yam-bean extract with soybean extract and fermentation period showed highly significant effect ($P<0.01$) on reducing sugar content of the soy-yamghurt probiotic drinks. The effect of ratio of yam-bean extract with soybean extract and fermentation period is shown in Figure 7.

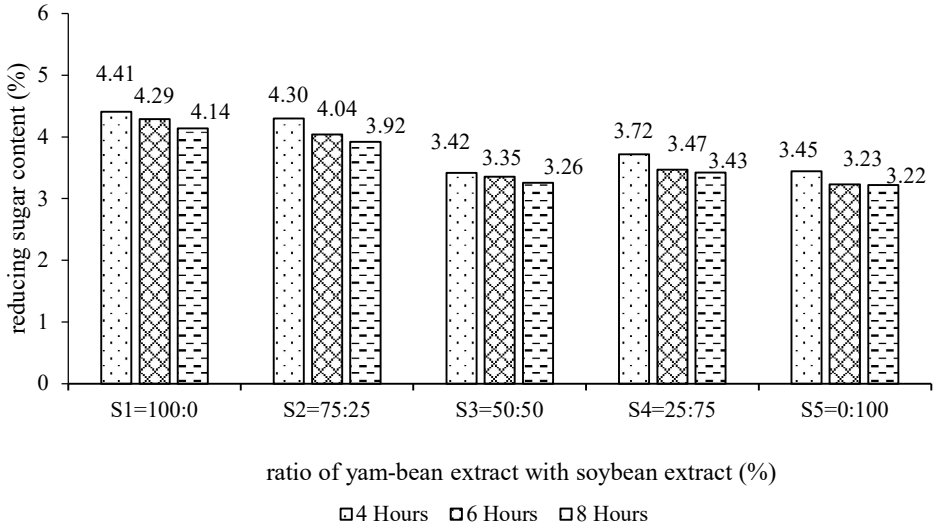

Figure 7. The Effect of Ratio of Yam-bean Extract with Soybean Extract and Fermentation Period on Reducing Sugar Content of the Soy-yoghurt Probiotic Drink

Figure 7 shows that treatment of S1H1 soy-yamghurt probiotic drinks with 100% yam-bean extract and 4 hours fermentation period had the highest reducing sugar content from all treatment which was 4.41%, while the treatment with result of the lowest reducing sugar content was S5H3

treatment with 100% soybean extract and 8 hours fermentation period was at 3.22%. The higher amount of soybean extract added and the longer the fermentation period, the reducing sugar content of soy-yamghurt probiotic drinks produced was decreased. Reducing sugars in foodstuffs are some monosaccharides (glucose, fructose, and galactose) and disaccharides (lactose and maltose) except for sucrose and polysaccharides. This sugar is formed due to the fermentation process by lactic acid bacteria found in soy-yamghurt. Lactic acid bacteria synthesize enzymes capable of breaking down carbohydrate components in starch into simple sugars including reducing sugars. The produce enzymes are able to hydrolyze yogurt causing an increase in free sugar levels.

3.2.5. Starch content

The interaction between the ratio of yam-bean extract with soybean extract and fermentation period gave no significant effect ($P>0.05$) on the starch content of soy-yamghurt, but each treatment factor provides highly significant effect ($P<0.01$) on the starch content. The effect of ratio of yam-bean extract with soybean extract and fermentation period on starch content can be seen in Figure 8 and Figure 9, respectively.

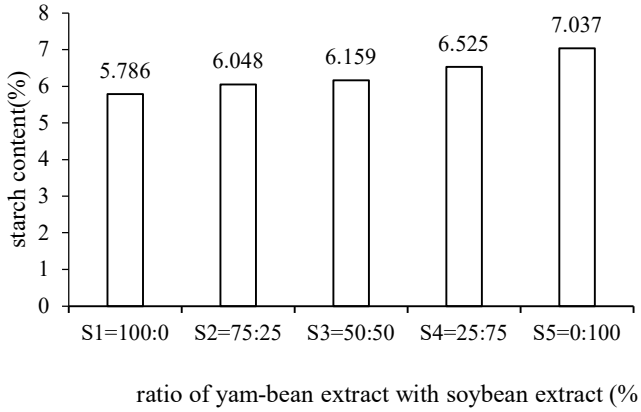

Figure 8. The Effect of Ratio Yam-bean Extract with Soybean Extract on Starch Content of Soy-yamghurt Probiotic Drinks

Figure 8 shows that the treatment with the highest starch content was S5 (0%:100%) treatment at 7.037% and the lowest starch content was treatment S1 (100%: 0%) at 5.786%. The higher amount of soybean extract added, the starch content of soy-yamghurt probiotic drinks produced was increased, This is presumably due to the presence of starch compounds in soybeans, which undergo gelatinization during heating in the processing. This gelatinization causes the soybean extract to become thick even before fermentation is carried out [26]. The starch content test was conducted to determine how much starch was contained in soy-yamghurt because the inulin in yam-bean is a non-starch water soluble polysaccharide. The fermentation process will hydrolyze starch, namely the breakdown of carbohydrates in yam-bean tuber starch to be lower.

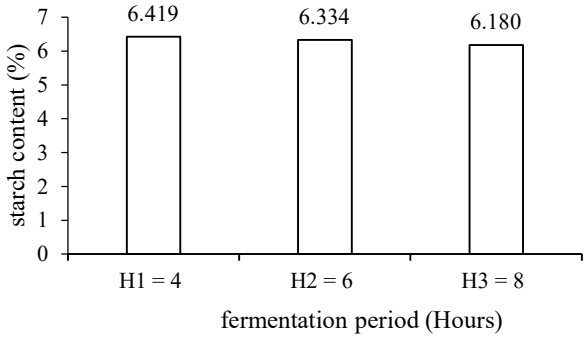

Figure 9. The Effect of Fermentation Period on Starch Content Soy-yamghurt Probiotic Drinks

Figure 9 shows that the treatment with the highest starch content was H1 (4 Hours) treatment at 6.419% and the lowest starch content was treatment H3 (8 Hours) at 6.180%. The longer the fermentation period, the lower the starch content because during fermentation, lactic acid bacteria produce extracellular enzymes such as amylase and protease that degrade the starch and protein present in soy-yamghurt into simple sugars and amino acids.

3.2.6. Glucose content

The interaction between the ratio of yam-bean extract with soybean extract and fermentation period gave no significant effect (P>0.05) on the glucose content of soy-yamghurt, but each treatment factor provides highly significant effect (P<0,01) on the glucose content. The effect of ratio of yam-bean extract with soybean extract and fermentation period on glucose content can be seen in Figure 10 and Figure 11, respectively.

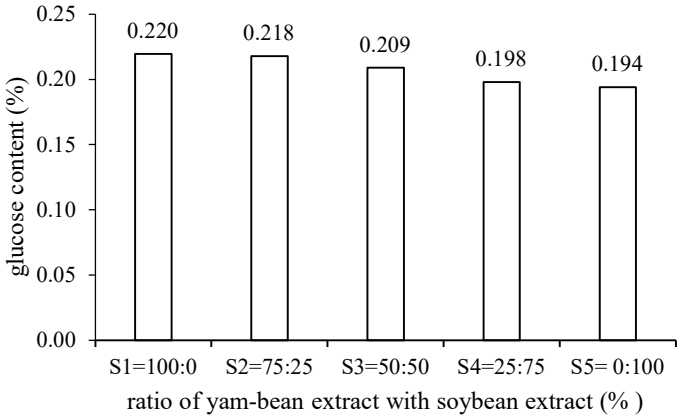

Figure 10. The Effect of Ratio Yam-bean Extract with Soybean Extract on Glucose Content of Soy-yamghurt Probiotic Drinks

Figure 10 shows that the treatment with the highest glucose content was S1 (100%:0%) treatment at 0.220% and the lowest glucose content was treatment S5 (0%: 100%) at 0.194%. The higher amount of soybean extract added, the glucose content of soy-yamghurt probiotic drinks produced was decreased, because it is suspected that the less amount of yam-bean extract causes glucose to dissolve in water relatively little so that less glucose is utilized by lactic acid bacteria for metabolic processes and growth of lactic acid bacteria.

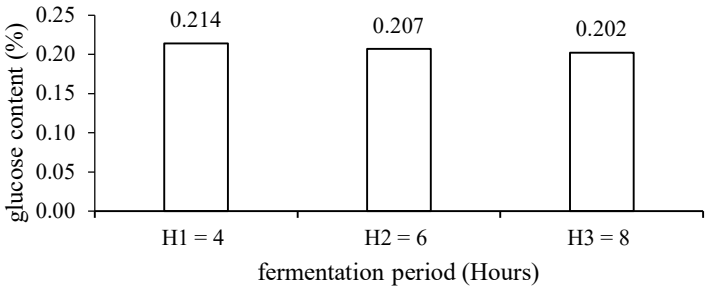

Figure 11. The Effect of Fermentation Period on Glucose Content Soy-yamghurt Probiotic Drink

Figure 11 shows that the treatment with the highest glucose content was H1 (4 Hours) treatment at 0.214% and the lowest glucose content was treatment H3 (8 Hours) at 0.202%. The longer the fermentation period, decreased the glucose content. The length of fermentation affects the amount of sugar converted into lactic acid and utilizes the sugar as a metabolism of lactic acid bacteria. Lactic acid bacteria utilize sugar as a source of energy, growth, and produce secondary metabolites in the form of lactic acid during the fermentation process. Therefore, more lactic acid bacterial cells are formed causing more glucose used for cell metabolism [25].

4. Conclusion and Recommendation

Higher soybean extract or lower the yam-bean extract decreased the moisture content, total sugar content, reducing sugar content and glucose content of the soy-yamghurt. However, the mixture resulted in the increase of protein content, viscosity and starch content. Additionally, fermentation periods reduced the moisture content, total sugar content, reducing sugar content, starch content and glucose content, but raised protein content and viscosity. The color of the soy-yamghurt probiotic drink is getting brighter/tends to be white, yellowish and slightly greenish, which is the color of the flavonoid group.

It is necessary to do further research on determining the shelf life of soy-yamghurt probiotic drinks so that it can be known a safe period of time to store soy-yamghurt.

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