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[ACCESS The effect of](#) whippy cream adding on the quality of frozen soyghurt as symbiotic ice cream To cite this article: Salam N Aritonang et al 2019 IOP Conf. Ser.: Earth Environ. Sci. 287 012029 View the article online for updates and enhancements. This content was downloaded from IP address 114.125.39.59 on 07/01/2020 at 01:47 The effect of whippy cream adding on the quality of frozen soyghurt as symbiotic ice cream Salam N Aritonang<sup>1</sup>, Elly Roza<sup>2</sup>, and Evy Rossi<sup>3</sup> 1,2 Department of Animal Production, Faculty of Animal Science -Universitas Andalas Padang, Indonesia. 3 Department of Agricultural Technology, Faculty of Agricultural, Universitas Riau, Indonesia. Email: snaritonang@ansci.unand.ac.id. Abstract. The presence of Lactic Acid Bacteria (LAB) in food is very important, as most of these LAB have beneficial effects in human body, so most LAB are generally potential as probiotics. This study aims to determine the quality of frozen soyghurt/synbiotic ice cream with the addition of whipping cream. Synbiotics is an ingredient and foods that contain both probiotics and prebiotics that beneficially affects the host by improving the survival and implantation of live microbial dietary supplement in the gastro intestinal tract. Prebiotics is a non-digestible food ingredient such as oligosaccharides substrates that match the enzymatic glycosidies hydrolase capacity of health promotion bacteria, that elicits the selective stimulation of growth and/or activity of one or a limited number of microbial genus/species in the gut microbiota that converts health benefits to the host. Soyghurt is one of the ingredients that includes synbiotics. This study began by making a synbiotic drink/soyghurt by inoculating Streptococcus thermophillus and probiotics isolated from okara is Lactobacillus plantarum SRCM 1 004 34 strain into a mixture of cow's milk and soy milk containing prebiotic, and then freezing it so that it is expected to produce a healthy Synbiotic Ice cream. This research was conducted experimentally using Completely Randomized Design with 4 treatments and 5 replications. The treatment is the addition of whipping cream with Soyghurt with the ratio: A = Whipping cream:Soyghurt (10:90), B = Whippy cream:Soyghurt (20:80) C = Whippy cream:Soyghurt (30:70) and D = Whippy cream:Soyghurt (40:60). The

variable was observed the quality of frozen soyghurt that consisted of protein and fat content, pH, Lactic Acid Bacteria count, overrun, melting point and sensory evaluation. The result of the research indicated that the adding of whipping cream in frozen soyghurt making was significantly increased fat content, pH, overrun, melting point, texture and decreased protein content, Lactic Acid Bacteria count and flavour of frozen soyghurt. The conclusion is the addition of whipping cream up to 40% (D) has produce frozen soyghurt with good quality yet. Keywords – frozen soyghurt, probiotic, prebiotic, synbiotic, whipping cream.

1. Introduction Synbiotics is an ingredient and foods that contain both probiotics and prebiotics [13] that beneficially affects the host by improving the survival and implantation of live microbial dietary supplement in the gastro intestinal tract by selectively stimulating the growth and/or by activating the metabolism of one or a limited number of health promoting bacteria and thus improving host welfare. The prebiotic presence in synbiotic mixture are generally considered to have one of two possible function. First, they stimulate the number and activity of beneficial microbes endogenous to the gut of the host, independent of the activity of the probiotic. Secondly, they are considered a lunch box for the [Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author\(s\) and the title of the work, journal citation and DOI. Published under licence by IOP Publishing Ltd 1](#) probiotics and should increase their survival while the beneficial microbes travel through the hostile environment of the gastro intestinal tract [12]. Probiotics are live microorganism which classified as capable of improving the intestinal microbial balance beneficial effect on the health of the individual when ingested regularly and in adequate concentration. Probiotic microorganisms generally produces lactic acid as a product of carbohydrates breakdown, beside produce bacteriocin and hydrogen peroxide form will suppress the growth of pathogenic bacteria [10] [16]. These bacteria called lactic acid bacteria [1]. Lactic acid and bacteriocin produced by lactic acid bacteria such as *Lactobacillus lactis* and *Streptococcus thermophilus*, act as biopreservatives because of their inhibitory effect against pathogenic microorganisms that endanger health [20]. Prebiotics is a non-digestible food ingredient that elicits the selective stimulation of growth and/or activity of one or a limited number of microbial genus/species in the gut microbiota that convers health benefits to the host [19]. Dietary fibre is classified as a non-digestible food ingredient, but not all fibre is considered a prebiotic. Owing to the fact that not all dietary fibre can be selectively fermented by one or a few members of the microbiota and thereby confer health benefit. Saccharolytic bacteria which are able to break down and ferment complex oligosaccharides contain glucosyl, galactosyl, and xylosyl are generally considered to be beneficial due to the metabolic by-product that the produce [6]. Therefore, food ingredients that contain the non-digestible oligosaccharides substrates that match the enzymatic glycosidase capacity of health promotion bacteria are primary prebiotics candidates. The main bacteria genera that are targeted by prebiotics are *Bifidobacterium* and *Lactobacillus* which most prebiotics that have been developed so far are carbohydrates or fibres [21]. Soyghurt is one of the ingredients that includes synbiotics. Soyghurt is a fermented product such as yoghurt made from soy milk with or without the addition of cow milk using probiotic bacteria such as *Lactobacillus acidophilus* and *Streptococcus thermophilus* [22]. In this study these probiotic bacteria can be replaced by the isolation from Okara that is *Lactobacillus plantarum* SRCM 1 004 34 strain [2]. Soyghurt has advantages compared with other milk fermentation products that are beneficial to health such as can prevent degenerative diseases such as cancer, osteoporosis, coronal heart [24]. This is because soy milk contains isoflavones as natural antioxidants [25]. In addition, soy milk also contains carbohydrates, fats, calcium, phosphorus, ferrum,

vitamins A, B1, B2 [3]. Consumption of soyghurt is also beneficial to the balance of ecosystems in the intestinal tract with increasing probiotic population and decreased population of pathogenic bacteria, thus reducing abdominal bloating, increasing flavor, reducing taste, giving new textures, preventing intestinal infections, and assisting intestines flora [14]. This is because soy milk contains nutrients that are prebiotic, which contains dietary fibre which includes non-digestible oligosaccharide type, in two main components of 20% rafinosa trisakarida with  $\alpha$ -galactosida bond between galactose- glucose and stakiose tetrasaccharides of 71% having two  $\alpha$ -galactoside bonds between galactose-galactose and galactose-glucose [23]. The quality of soyghurt is usually assessed based on the acidity (pH), total lactic acid bacteria (LAB) and viscosity. The taste of soyghurt is still less desirable and favored by the consumer. One effort that can be done is to process soybean into soyghurt ice cream (frozen soyghurt). The making of soyghurt ice cream can also further increase the diversification of soybean process and support the marketing value in the community, because ice cream much favored by all age groups. In addition, ice cream is a frozen dish with semi-solid texture and high nutritional value. Soyghurt is fermented milk which contains low fat content, so it needs to be added fat derived from vegetable fats, one of which is whippy cream. The function of fat in making ice cream soyghurt is as a delicate texture, flavor producer and gives a synergistic effect on the additional flavor used [9]. If the fat content of ice cream is less than 10%, then the ice texture is more coarse and cooler [8]. Therefore, fat is the most important part in making ice cream so it should get attention in every formulation. The source of whippy cream fat comes from vegetable fat that the amount of fat content is not less than 12%. The use of isolated probiotics from okara along with prebiotics from soy milk is then applied in the manufacture of synbiotic milk products which then freeze it, it is expected to obtain a healthy Frozen Soyghurt as Synbiotic Ice Cream.

2. Material and methods This research began by making a sinbiotic drink by inoculating probiotics isolated from okara into a mixture of cow's milk with soy milk containing prebiotic then freezing it so that it is expected to produce a healthy Frozen Soyghurt as Synbiotic Ice cream.

2.1. Making soyghurt A mixture of cow's milk with soy milk each of 500 ml added 5% sugar. It is then pasteurized at 72oC for 15 minutes, then cooled rapidly to 42oC. After that inoculated starter as much as 3% [2] that consisted of 1% Streptococcus thermophillus and 1% Lactobacillus plantarum SRCM 1 004 34 strain then mix evenly. Furthermore, it was incubated for 8 hours at 37oC [2]. The soyghurt produced is made into the ingredients of frozen soyghurt.

2.2. Making frozen soyghurt The process of making frozen soygurt includes: mixing ingredients, pasteurization, homogenization, aging, freezing, hardening and storage. Mixing ingredients for ice cream is done gradually. The mixture of ingredients to be frozen into ice cream is called Ice cream Mix (ICM). The manufacturing process is: mix whippy cream into liquid ingredients (soyghurt) at temperature < 3oC). Liquid whippy cream is shaken at high speed for  $\pm$  3 minutes until it expands, then added soybean and sugar. Homogenizing for 10 minutes at speed 1500 rpm. Put into ICM with temperature 5oC for 45 minutes. Then stored at freezing temperature -10oC for 24 hours. This research was conducted experimentally using Completely [Randomized Design](#) (RAL) [with 4 treatments and 5 replications](#). The [treatment](#) is [the addition of](#) Whippy cream with Soyghurt with the ratio: A = Whippy cream : Soyghurt (10:90) B = Whippy cream : Soyghurt (20:80) C = Whippy cream : Soyghurt (30:70) D = Whippy cream : Soyghurt (40:60)

2.3. Variable observed

2.3.1. Protein Content (Kjeldahl Method) 2.3.2. Fat Content (Soxhlet Method) 2.3.3. pH (pH meter) 2.3.4. Lactic Acid Bacteria Microbiological tests use the spread surface plate method: Take 1 ml sample of frozen soyghurt using a micro pipette and then adding 9 ml of 0.85% physiological salt for a 10-1 dilution and continuing until 10-7 dilution. Then pipette 0.1 ml starting from 10-5 dilution to 10-7 dilution to be

inoculated on MRS-agar medium by dripping a sample on a petri dish containing MRS-agar and the samples were flattened on the surface of the medium with shiny steel / curved glass rods that had been sterilized by burning over a bunsen fire. The process of inoculation is carried out in a sterile room, namely a laminar flow cabinet. The inoculated petri dish is then incubated in the incubator for 48 hours at 37°C in order to avoid dripping water that may be attached to the inner wall of the cap. The LAB colonies that grow are counted using a colony counter. Calculation of LAB colonies can be calculated by the formula (log cfu/ml). LAB total per ml = Colony count  $\times 1 \times 10^5$  Pengenceran 2.3.5. Overrun [15] Overrun is the development of the volume of ice cream which is calculated based on the difference in the ice cream volume with the volume of dough in the same mass or based on the difference of ice cream mass and the dough mass on the same volume. The weight of the dough is weighed on the same volume before the cooling process and heavy weighting of ice cream is put into the freezer. Overrun value is calculated by formula:  $\frac{W_1 - W_2}{W_2} \times 100\%$  Where,  $W_1$ : Dough weight /volume unit  $W_2$ : Ice cream weight/ volume unit 2.3.6. Melting point [7] Melting points were measured by: put 50 grams of ice cream on filter paper clamped between Petridish at room temperature ( $\pm 26^\circ\text{C}$ ) and incubator temperature ( $\pm 37^\circ\text{C}$ ). The time required to melt the ice cream melts complete measured in minute. 2.3.7. Sensory evaluation of frozen soyghurt Sensory Evaluation uses hedonic and descriptive tests. The panelists who tested were semi-trained panelists with 25 people. Sensory evaluation aims to determine the level of panelist preference which includes flavour and texture with a range from very like up to not very like. Descriptive test aims to determine the characteristics of frozen soyghurt in each treatment that was tested for flavour and texture. The sample is placed in a clean container with random number code. Panelists are asked to provide an assessment of each sample on the questionnaire form presented. 3. Results and discussion 3.1. Protein Statistic analysis shows that protein content of Frozen Soyghurt significantly ( $P < 0,5$ ) influenced by whippy cream adding (Table 1). The addition of whippy cream will reduce the use of soyghurt and reduce the protein content of Frozen Soyghurt. The protein content of Frozen Soyghurt added whippy cream up to 40% (D) was lowest (5.69%) significantly followed by treatment C (6.10%), B (6.23%), and the highest in treatment A is 6.45%. In which the protein content of Frozen Yoghurt treatment B to treatment C did not significantly ( $P > 0.05$ ). The decrease of protein content of Frozen Soyghurt along with the increase of whippy cream adding caused of that soyghurt as the source of protein, so that with the increase in whippy cream the use of soyghurt decreases, which is followed also by the decrease protein content of Frozen Soyghurt. The high protein content in the Frozen Soyghurt was produced images illustrates that Frozen Soyghurt has a higher nutritional value and can provide benefits to consumers. The results of this study are in accordance with [5] that the protein content of Frozen Soyghurt is 4.5 - 5.7%. According to the ice cream quality standards (SNI 01-3713-1995), the protein content is at least 2.7%, while the protein content in this study ranges from 2.06 to 3.73%, which means that the ice cream in this study has in line with the quality standards of ice cream. Table 1. The effect of whippy cream adding on the quality of frozen soyghurt. Variable A B C D Protein (%) 6.45a 6.23b 6.10b Fat (%) 6.78a 7.21a 7.40a pH 4.83a 4.90b 5.22c LAB Count (log cfu/ml) 9.57a 9.57a 9.06a Overrun (%) 0.87a 1.10b 1.27c Melting Point (hour) 1.06a 1.10a 1.19b Flavour 4.03a 4.20a 3.10b Texture 3.67a 3.60a 3.73a 5.69c 8.50b 5.40d 8.26b 1.40c 1.31c 3.23b 4.30b Values in the same row followed by different letter are significantly different ( $P < 0.05$ ) 3.2. Fat The adding of whippy cream significantly ( $P < 0.05$ ) increased fat content of Frozen Soyghurt. Statistic analysis on Table 1. shows that fat content of Frozen Soyghurt on treatment D is highest (8.50%) followed by treatment C (7,40%), B (7,21) and the lowest of fat content of Frozen Soyghurt in treatment A is 6.78%. The highest fat

content of Frozen Soyghurt in treatment D caused in this treatment the highest addition of whippy cream while the lowest use of soyghurt is lowest. Whippy cream contains high fat, which is 17%, while soyghurt is a low-fat food ingredient. The soyghurt is a product of processing milk mixture with soy milk and lactic acid bacteria. Lactic acid bacteria in addition to decomposing lactose into lactic acid simultaneously utilize crude fiber in soy milk to increase its activity [12] in producing lipolytic enzymes to decompose fat into fatty acids. So the higher of soyghurt added in Frozen Soyghurt making, the higher the lipolitic enzymes concentration to breaking fat into fatty acids so that the fat content of the Frozen Soyghurt is the lowest. Fat is needed in the formation of ice cream structures where large globular fat forming granules determines the size of the air cavity in the cell. This fat also cause a soft texture on ice cream where evenly distributed fat with a homogeneous and small size can help the expected melting point of ice cream 3.3. pH The higher the addition of whippy cream, the higher the pH of Frozen Soyghurt. Statistical analysis showed that the highest addition of whippy cream in treatment D the highest Frozen Soyghurt pH significantly ( $P < 0.05$ ) which was 5.40, followed by treatment C (5.22), B (4.90) and the lowest in treatment A (4.83). Increasing the pH of Frozen Soyghurt along with the increasing whipping cream addition is influenced by the presence of lactic acid bacteria and carbohydrate content. Soyghurt is a kind of yoghurt made from soy milk in fermentation process using a mixture of lactic acid bacteria such as *Lactobacillus bulgaricus* and *Streptococcus thermophilus* [11]. LAB in soyghurt in this ice cream mixture will degrade polysaccharides and ferment lactose, sucrose, and galactose to produce more lactic acid, consequently the pH decreased. The higher the addition of whippy cream, the lower the use of soyghurt so that the LAB count in frozen soyghurt which degrade polysaccharides into lactic acid was also lower followed by the low lactic acid produced. As a result, frozen soyghurt pH was highest.

3.4. Lactic Acid Bacteria count Statistic analysis showed that Lacto Acid Bacteria Count of Frozen Soyghurt significantly ( $P < 0,5$ ) influenced by whippy cream adding (Table 1). The addition of whippy cream will reduce the lactic acid bacteria count of Frozen Soyghurt. The Lactic Acid Bacteria of Frozen Soyghurt added whippy cream up to 40% (D) was lowest ( $8.26 \times 10^6$  cfu/ml) significantly followed by treatment C ( $9.06 \times 10^6$  cfu/ml, treatment B ( $9.57 \times 10^6$  cfu/ml ), and the highest in treatment A is  $9.57 \times 10^6$  cfu/ml. In which Lactic Acid Bacteria count of Frozen Soyghurt treatment C to treatment B and to treatment A did not significantly ( $P > 0.05$ ). The low of lactic acid bacteria count in Frozen Soyghurt added with whippy cream in treatment D was caused by the lowest soyghurt used in this treatment. The low level of soyghurt in the ice cream mixture means the low number of lactic acid bacteria in ice cream sinbiotis because in soyghurt contains lactic acid bacteria. In accordance with the opinion of [22] that soyghurt is a fermented product of soy milk using probiotic bacteria such as *Lactobacillus delbrueckii*, *Lactobacillus achidopilus*, and *Lactobacillus bulgaicus*. The decrease of LAB count during the process of Frozen Soyghurt making also occurs because the cooling process of the dough so that LAB cannot grow optimally. The activity of mixed culture of *Streptococcus thermophilus* and *Lactobacillus plantarum* in Frozen Soyghurt has an optimum growth temperature of 15-37°C and is able to produce antimicrobial plantaricin which is able to suppress the growth of pathogenic microbes so that it is safe for consumers' health. The decrease in LAB count is caused bacterial cell damage at freezing temperatures, but not as fast as at high temperatures. If bacteria survive early in the freezing temperature, then the bacteria can stay alive for a long time in a frozen state, where the function of the cell halt temporarily and if the surrounding media is thawed again the metabolism can last again [4]. The lactic acid bacteria count in all treatments ranged from 8.26 to  $9.57 \times 10^6$  cfu/ml. This has in line to the standard number of probiotics contained in food ingredients. Similar with [26] which states that the

minimum of lactic acid bacteria count in probiotic food products is 6 log<sub>10</sub> cfu/ml, so the greater of BAL count contained in ice cream the better. [22] stated that one of the requirements of probiotic products in fermented milk is that it contains live microbial cells of 6 log<sub>10</sub> up to 8 log<sub>10</sub> cfu/ml.

3.5. Overrun The adding of whippy cream significantly ( $P < 0.05$ ) increased overrun of Frozen Soyghurt. Statistic analysis on Table 1. showed that overrun of Frozen Soyghurt on treatment D is highest (1,40%) followed by treatment C (1,27%), B (1,10%) and the lowest of synbiotic ice cream overrun in treatment A is 0,87%. Overrun of Frozen Soyghurt treatment D to treatment C did not significantly ( $P > 0.05$ ). Increasing the overrun of Frozen Soyghurt along with the addition of whippy cream caused in the manufacture of ice cream in addition with functioning as a texture softener, whippy cream also functions as a swell. Whippy cream use to help the development process and the formation of cream and the texture and shape of a product [8]. Thus, the more whippy cream is used, the more the frozen soyghurt overrun value will increase. Whippy cream has an important role in ice cream such as increasing flavor, producing a smooth texture, giving the body and helping melt because it plays a role in fat destabilization [18].

3.6. Melting point Statistic analysis shows that the melting point of Frozen Yoghurt significantly ( $P < 0,5$ ) influenced by whippy cream adding (Table 1). The addition of whippy cream will reduce the use of soyghurt and increase the melting point of frozen yoghurt. The addition of whippy cream to 40% (D) significantly resulted in the highest melting point for sinbiotic ice cream, which was 1.31 hours followed by treatment C, B, and the lowest in treatment A, which was 1.06 hours. The increasing melting point of frozen yoghurt along with the increase of whipping cream added due to whipping cream plays a role in increasing the volume of synbiotic ice cream products [8]. As a result, with the increase in ice cream symbiotic volume, the air in the dough will form air spaces which are released immediately along with melting ice cream. This is in line with the state of [17] that the speed of melting ice cream is influenced by the amount of air trapped in mixed ingredients. The higher the amount of fat aggregate, the higher the resistance to melting ice cream. As in this study, the addition of the highest whippy cream (D) in the manufacture of Frozen Soyghurt has increased the fat content of Frozen Soyghurt followed by increasing melting points of Frozen Soyghurt in the same treatment.

3.7. Flavour The adding of whippy cream significantly ( $P < 0.05$ ) decrease flavour value of Frozen Soyghurt. Statistic analysis on Table 1. showed that flavour value of Frozen Soyghurt on treatment D is lowest (3.23) followed by treatment C (3.1), A (4.2) and the highest of flavour value of Frozen Soyghurt in treatment B is 4.2 in which flavour value of Frozen Soyghurt treatment A to treatment B and treatment C to treatment D did not significantly ( $P > 0.05$ ) each other. The decrease in the value of the Frozen Soyghurt flavor added with higher whippy cream in treatment C and treatment D caused of the lower composition of the soyghurt in Frozen Soyghurt so that the flavour was less acidic and the panelists did not liked it. When associated with the pH value in this study, Frozen Soyghurt with a low pH has a higher preference score. This is due to the flavour of the acid produced by fermentation activity of Lactic Acid Bacteria in the soyghurt. This is in line with the state of [22] that soyghurt is a fermented product such as yogurt made from soy milk with or without the addition of cow milk using lactic acid bacteria such as *Lactobacillus acidophilus* and *Streptococcus thermophilus*.

3.8. Texture The adding of whippy cream significantly ( $P < 0.05$ ) increased texture value of Frozen Soyghurt. Statistic analysis on Table 1. showed that texture value of Frozen Soyghurt on treatment D is highest (4.30) followed by treatment C (3.73), A (3.67) and B (4.2) in which texture value of Frozen Soyghurt treatment A to treatment B and treatment C did not significantly ( $P > 0.05$ ) each other. The increasing value of the Frozen Soyghurt texture added with the highest whipping cream (D) is caused by the increase in whipping cream followed by

increasing the fat content of Frozen Soyghurt. This fat content inhibits the formation of large ice crystals during freezing so that the Frozen Soyghurt produced has a slightly soft texture and is preferred by the panelists. In accordance with [9] stated that the function of fat in whipping cream in the Frozen Soyghurt making is to a smooth texture and improve the flavour.

4. Conclusion The addition of whippy cream in the Frozen Soyghurt making significantly ( $P < 0.05$ ) increased fat content, pH, overrun and melting point and reduced protein content, Lactic Acid Bacteria count and the flavour of Frozen Soyghurt. The adding whippy cream up to 40% (D) has produce Frozen Soyghurt with good quality yet.

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