Organoleptic, chemical, and microbiological characteristics of goat milk yogurt using *Lactobacillus plantarum* T14 and T35 with the addition of stevia sweetener

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**Abstract.** Yogurt is a functional food that is in demand by the public. The high sucrose content in yogurt can cause health problems, especially for people with diabetes mellitus. Making goat milk yogurt using stevia as a sweetener is one solution. The purpose of this study was to know the organoleptic, chemical, and microbiological characteristics of goat milk yogurt fermented using *Lactobacillus plantarum* T14 and T35, which added with stevia sweetener. This research was conducted using a Factorial Completely Randomized Design. The first factor was the strain of lactic acid bacteria (LAB), namely *Lactobacillus plantarum* T14 and *Lactobacillus plantarum* T35. The second factor was the concentration of stevia, namely 0%; 0.25%; and 0.5%. The yogurt processing was carried out by adding goat milk with 10% skim milk and 1% (v/v) LAB inoculum, then incubated at 37 °C for 16 hours. We found that goat milk yogurt with a *Lactobacillus plantarum* T14 and a stevia concentration of 0.25% was the most preferred. The yogurt contents of protein, water, fat, titrated acid, and ash content were 6.48-6.57%; 78.11-80.45%; 5.03-5.16%; 0.56-0.61%; and 1.50-1.55%, respectively. The log increase of *Lactobacillus plantarum* T14 and T35 about 1.48-1.54 and 0.17-0.45, respectively.

**1. Introduction**

The lifestyle of the people in the era of globalization demands a healthy lifestyle. A healthy lifestyle has an impact on the choice of food types consumed. Food products that are rapidly developing today are functional foods or foods that have a good impact on health. Functional food is food that naturally or has gone through a process, contains one or more compounds based on scientific studies, which are considered to have certain physiological functions that are beneficial to health [1]. For example, functional food products are fermented milk products such as kefir and yogurt. This product is starting to be of interest to the public in various circles because it has been clinically proven to have a positive effect on health [2]. The benefits of consuming yogurt are to help lactose intolerant sufferers, treat diarrhea, prevent cancer, create a good intestinal environment by suppressing bad bacteria [3].

Yogurt is a dairy product fermented by the bacteria *Lactobacillus bulgaricus* and *Streptococcus thermophilus* and/or using other lactic acid bacteria [4]. According to ISN [5], yogurt can be added with other food additives that are permitted to be used. One of the common food additives used in the yogurt industry is a sweetener, for example, sucrose. However, excessive use of sugars such as sucrose...
is associated as one of the triggers for diabetes mellitus. The prevalence of diabetes mellitus sufferers in Indonesia tends to increase from year to year, namely 6.9% in 2013 to 8.5% in 2018. In addition, Indonesia also ranks seventh as a country with the highest prevalence of diabetes mellitus sufferers in the world in 2019, with the second highest percentage of causes of death in the world [6].

One of the solutions to getting good yogurt for diabetes mellitus sufferers is to substitute sucrose sweeteners with natural non-calorie sweeteners. Stevia is a sugar substitute sweetener whose compound is extracted from the *Stevia rebaudiana* plant and is safe for consumption at a dose of 3 mg/kg body weight per day. The advantages of stevia sweeteners compared to sucrose, including having a sweetness level up to 300 times higher than sucrose, does not damage teeth, can lower blood pressure, and does not increase blood sugar levels [7]. Stevia as a sweetener, is classified as a non-nutritive sweetener, which is a sweetener that does not provide calories. Although it can contribute to calories, its small use (due to the high level of sweetness) causes the calories it contains very little. The compound contained in it is steviol glycosides. This compound is quite stable at pH 4-8 and is even stable at high temperature processes [8].

The existence of Peranakan Etawa (PE) goat farms in Sleman and Gunungkidul Regencies, Yogyakarta, means that the production of goat milk is quite high but has not been matched by processing it into various kinds of products. According to [9], goat milk production averages 1.2 liters/day. The center of PE goat farm in Sleman Regency with a population of 5,994 goats can contribute to the production of Goat milk by 7,192 liters/day [10]. Therefore, this study aims to determine the organoleptic, chemical and microbiological characteristics of Goat milk yogurt using *Lactobacillus plantarum* T14 and T35 with the addition of stevia sweetener. With this research, it is hoped that the stevia-sweetened goat milk yogurt can increase the diversification of Goat milk products and can fulfill the sensory aspects, which are acceptable to consumers and contain good nutrition for the body.

2. Methodology

2.1. Material
The material used in this study was Goat milk obtained from PE goat farms in Girikerto Village, Turi, Sleman, Yogyakarta. Skim milk, vanilla flavor, and stevia sweetener are obtained from the market in Yogyakarta. The starter cultures of *Lactobacillus plantarum* T14 and T35 were obtained from the Center for Food and Nutrition Studies, UGM Yogyakarta.

2.2. Equipment
The equipment used in this study were glass equipment: test tube, Erlenmeyer size 100 ml or 125 ml, measuring cup, spatula. Other equipment is Eppendorf tube, centrifuge (KPLC series centrifuge), incubator 37°C, laminar flow cabinet (Labconco), autoclave (EYELA MAC 5100), -18°C freezer and 4°C refrigerator (SHARP), analyte scales (Fujitsu), pots and stoves, micropipettes, blue tip, autoclave.

2.3. Research methods
This research was using the Factorial Completely Randomized Design with two factors. The first factor was the bacterial strains *Lactobacillus plantarum* T14 (A1) and *Lactobacillus plantarum* T35 (A2). The second factor was the concentration of stevia 0% (B1), 0.25% (B2) and 0.5% (B3) with two replications of the treatment.

The making of goat milk yogurt is as follows: an amount of 100 ml (for each sample) were pasteurized at 60 °C for 30 minutes. After that, it was cooled to a temperature of 30-40°C and the milk was added with stevia sweetener with concentrations according to the treatments. Furthermore, 1% (v / v) of *Lactobacillus plantarum* T14 and T35 as starter cultures were added and then incubated for 16 hours at 37°C, under facultative anaerobic conditions. The population starter cultures are log 7.23 CFU/ml for *L. plantarum* T14, and log 7.93 CFU/ml for *L. plantarum* T35.
The organoleptic test was conducted by the hedonic method on color, aroma, taste, consistency, and overall preference [11]. Moisture, Fat, protein, ash content and titrated acidity were analyzed [12]. Microbiological analysis, including the total lactic acid bacteria, were conducted according to the method presented by [12]. The data were analyzed by ANOVA One Way to determine the effect of treatment on all observed variables. To find out the average difference due to the effect of treatment, analysis of the Duncan's Multiple Range Test method at 5% level was carried out [13].

3. Results and discussion

3.1. Organoleptic goat milk yogurt

Table 1 shows that the panelists' preference for the color of yogurt with different treatments of lactic acid bacteria (LAB) and stevia concentrations ranged from 6.17 to 6.54 with slightly like criteria. The higher of stevia concentration, the lower the panelist's input because the resulting color is less attractive. These results are in accordance with research [14], in the yogurt color test, it was seen that the more stevia added to the yogurt showed the panelists were less useful and the hedonic test of the resulting color was getting smaller. Yogurt with the addition of sucrose produces a white color, while the addition of stevia and a combination of stevia sucrose, the color of yogurt shows a white color with a mixture of stevia powder. [15, 16] also reported that the more stevia powder added, the less attractive the yogurt color. According to [17], color is one of the parameters used to assess a food product and can support its quality. Food that has an attractive color will create a positive impression, although it does not necessarily taste good.

| Stevia concentration (%) | Lactobacillus plantarum T14 | Lactobacillus plantarum T35 |
|-------------------------|-----------------------------|-----------------------------|
| Attributes organoleptic  | 0.00  | 0.25  | 0.50  | 0.00  | 0.25  | 0.50  |
| Color                   | 6.21<br>a | 6.34<br>b | 6.37<br>b | 6.04<br>b | 6.34<br>b | 6.38<br>b |
| Aroma                   | 5.63<br>b | 6.29<br>b | 6.04<br>b | 4.92<br>b | 6.08<br>b | 5.96<br>b |
| Taste                   | 4.50<br>b | 6.13<br>b | 6.29<br>b | 4.83<br>b | 6.21<br>b | 6.42<br>b |
| Consistency             | 4.04<br>b | 5.25<br>b | 4.17<br>b | 5.38<br>b | 5.29<br>b | 5.67<br>b |
| Overall                 | 4.50<br>b | 5.88<br>b | 5.83<br>b | 4.75<br>b | 5.92<br>b | 5.91<br>b |

Note: Different superscript letters show significantly different values (α <0.05) with One Way Anova and Duncan's advanced test.

1 = very. very dislike; 2 = very dislike; 3 = dislike; 4 = somewhat disliked; 5 = neutral; 6 = rather like it; 7 = likes; 8 = really like; 9 = really. really like

The results of the preference test in Table 1. show that the highest assessment of color was found in the addition of 0.25% stevia concentration both in the treatment of Lactobacillus plantarum T14 and Lactobacillus plantarum T35 strains. The level of preference for the panelists towards the aroma attribute ranged from 4.92-6.29, meaning that the panelists had a neutral assessment towards a bit like it. This shows that the aroma of goat milk yogurt from this study is still acceptable to the panelists. Goaty odor is a problem from several previous studies regarding panelist acceptance of goat milk yogurt. A study conducted by [18, 19] show that the presence of goaty odor in goat milk can reduce the panelists' preference for yogurt.

Panelists' ratings on taste attributes ranged from 4.5-6.42 with the assessment criteria being neutral towards somewhat like. The higher the concentration of adding stevia to yogurt, the higher the preference value of the panelists. Panelists' preference for different flavors in the addition of stevia treatment. The greater the addition of stevia, it gives a sweet taste so that it will be more liked by the panelists. Meanwhile, the level of preference for the consistency attribute for all yogurt samples ranged from 4.04-5.69 with the assessment criteria being somewhat disliked to neutral.
In the overall evaluation attribute, the yogurt with the highest acceptance rate was yogurt treated with _Lactobacillus plantarum_ T14 and T35 strains with the addition of 0.25% stevia concentration. The overall favorite score ranged from 4.5-5.92 with the assessment criteria approaching neutral to somewhat like it. These results are in line with research conducted by [21], panelists' preference for goat milk yogurt is still lower when compared to cow’s milk yogurt. Likewise, research conducted by [21], regarding organoleptic tests on goat milk yogurt and cow's milk with the addition of Rosella, panelists prefer cow's milk yogurt to goat milk yogurt. Likewise, explained by [22] in their research, it shows that goat milk yogurt is less preferred when compared to cow's milk yogurt, because the hydrolysis of the fat content in milk causes the presence of free fatty acids that smell rancid. The fat content in goat milk (4.29%) is higher than cow’s milk (3.45%) [23]. Besides that, the high content of caproic fatty acids in goat milk also causes goaty odor which is less preferred by consumers [24].

### 3.2. Chemical content of goat milk yogurt

#### 3.2.1. Protein content

The chemical content of goat milk yoghurt is presented in table 2. The protein content in goat milk yogurt ranged from 6.48% - 6.57% and was not significantly different. At the time of fermentation the protein is broken down into amino acids which have a higher digestibility level for the body. As explained by [25], that there is proteolytic activity caused by the protease enzyme during yogurt fermentation, especially during the log phase. When compared with the standard quality of yogurt from INS (Indonesian National Standard) Yogurt No. 01-2981-2009, protein content has met the standard [5] explains that the minimum protein content of yogurt is 2.7%. A high amount of protein will be good for yogurt consumers. According to [25], with the presence of protein content high in yogurt can make yogurt more nutritious.

**Table 2. Chemical composition of Goat milk yogurt with two starters of L. plantarum at several concentrations.**

| Stevia concentration (%) | _Lactobacillus plantarum_ T14 | _Lactobacillus plantarum_ T35 |
|--------------------------|--------------------------------|--------------------------------|
|                          | 0                             | 0.25                           | 0                             | 0.25                           | 0.5                           |
| Protein content (%)      | 6.55<sup>a</sup>              | 6.48<sup>a</sup>              | 6.57<sup>a</sup>              | 6.52<sup>a</sup>              | 6.51<sup>a</sup>              | 6.53<sup>a</sup>              |
| Fat content (%)          | 5.12<sup>a</sup>              | 5.04<sup>a</sup>              | 5.03<sup>b</sup>              | 5.16<sup>a</sup>              | 5.08<sup>a</sup>              | 5.11<sup>a</sup>              |
| Ash content (%)          | 1.55<sup>a</sup>              | 1.53<sup>a</sup>              | 1.55<sup>c</sup>              | 1.53<sup>a</sup>              | 1.53<sup>a</sup>              | 1.50<sup>a</sup>              |
| Water content (%)        | 78.97<sup>b</sup>             | 80.45<sup>b</sup>             | 78.86<sup>ab</sup>            | 78.11<sup>a</sup>             | 79.52<sup>ab</sup>            | 78.63<sup>ab</sup>            |
| Acid is titrated (%)     | 0.6<sup>c</sup>               | 0.61<sup>a</sup>              | 0.56<sup>b</sup>              | 0.59<sup>a</sup>              | 0.605<sup>a</sup>             | 0.58<sup>a</sup>              |

Note: Different superscript letters show significantly different values (α <0.05) with One Way Anova and Duncan's advanced test

#### 3.2.2. Fat content

The fat content of goat milk yogurt with _L. plantarum_ T14 starter treatment ranged from 5.03-5.12%, while the fat content of goat milk yogurt starter _L. plantarum_ T35 ranged from 5.08% -5.16% (Table 2). The fat content in the sample with the addition of stevia 0.25% was lower than the other concentrations at both _L. plantarum_ T14 and T35. but this difference was not significant. When compared with the standard quality of yogurt in INS No. 01-2981-2009, the fat content of 5.08% -5.16% has met the quality standard of yogurt. In INS no. 01-2981-2009, it is explained that the fat content is divided into 3 parts, namely high fat (minimum 3%), low fat (0.6-2.9%), and no fat (maximum 0.5%). With this standard of fat content, this yogurt is included in the high fat yogurt group, which indicates that the fat content is high enough [5].

#### 3.2.3. Ash content

The ash content of goat milk yogurt ranged from 1.53% -1.55% (table 2) and there was no statistically significant difference between treatments. The ash content does not meet INS standard number 01-2981-2009 concerning the quality of yogurt (maximum of 1%) [5], because the presence of high ash content in goat milk and powdered skim milk. The ash content represents the
mineral content in yogurt. Most of the minerals in yogurt come from minerals in goat milk such as potassium, sodium, phosphorus, calcium, and so on.

3.2.4. **Water content.** The water content of Goat milk yogurt ranged from 78.86% - 80.45% for *L. plantarum* T14 strain yogurt and 78.11% - 79.52% for *L. plantarum* T35 strain yogurt (table 2). The water content was slightly higher in the 0.25% concentration of yogurt although the difference was not significant. According to [22] the maximum water content in yogurt should be a maximum of 84%. Because if it is more than 84% it will be less thick which will affect the texture/thickness. So that the water content of the results of this study is in accordance with that recommended by [26].

3.2.5. **Acidity is titrated.** Goat milk yogurt with *L. plantarum* T14 starter has a titrated acidity ranging from 0.56-0.61% and *L. plantarum* T35 ranging from 0.58-0.61% (table 2). Titrated acidity indicates the amount of lactic acid present in the sample. As it is known that lactic acid is produced by lactic acid bacteria as a result of the metabolism of lactose in milk. The higher the titrated acidity, the higher the acidity level, but this difference is not significant, when compared with the quality standard of yogurt [5]. The acidity level titrated in goat milk yogurt has met the standard. According to INS standard number 01-2981-2009 concerning the quality of yogurt, the standard of titrated acidity is in the range of 0.5% - 2.0%.

3.3. **Microbiological goat milk yogurt**

The microbiological characteristics of goat milk yogurt are presented in figure 1 and figure 2. Goat milk yogurt which was given two treatments, namely the addition of starter *L. plantarum* T14 and T35. and addition of stevia concentration (0%; 0.25%; 0.5%) counted the number of cells using the TPC (Total Plate Count) method at the 16th hour of fermentation. The results were then compared with the number of bacterial cells added at 0 hours.

From the graph of cell count, it can be seen that the highest average increase is in goat milk yogurt which is given the *L. plantarum* T14 culture starter. The increase in the number of *L. plantarum* T14 cells in goat milk yogurt ranged from 1.48-1.54 log bacteria for all variations of stevia concentration. while in *L. plantarum* T35 there was only an increase in the number of cells by 0.17-0.45 log bacteria. This result was due to the number of starter cultures *L. plantarum* T35 which were inoculated close to log 8 where the bacteria would be more difficult to grow because of the high competition between bacteria for nutrients.

In figures 1 and 2, it can be seen that the growth of *L. plantarum* cells with the addition of 0.25% stevia has the highest number of cells among other stevia concentrations. although not significantly different. Lactic acid bacteria *L. plantarum* T14 and *L. plantarum* T35 are indigenous lactic acid bacteria isolated from traditional Indonesian fermented foods [27]. According to [28] that the two lactic acid bacteria were able to grow on milk cages well. Thus both LAB were also able to grow on the Goat milk medium used in this study. However, the growth of *L. plantarum* T35 was less than optimal due to the higher initial cell count of 7.93 log. According to [29], the number of bacteria that need to be added to yogurt is 6-7 log CFU/ml.
Figure 1. The total number of bacteria at 0 and 16 hours of goat milk yogurt fermentation with *Lactobacillus plantarum* T14.

![Bar chart showing the total number of bacteria at 0 and 16 hours of fermentation with *Lactobacillus plantarum* T14.](image1)

Figure 2. The total number of bacteria at 0 and 16 hours of goat milk yogurt fermentation with *Lactobacillus plantarum*.

![Bar chart showing the total number of bacteria at 0 and 16 hours of fermentation with *Lactobacillus plantarum*.](image2)
4. Conclusions
The organoleptic characteristic of goat milk yogurt that most panelists liked was yogurt with *Lactobacillus plantarum* T14 type treatment and a stevia concentration of 0.25%. The chemical characteristics in this research have met INS number 01-2981-2009 regarding the quality standard of Yogurt, except for the ash content. Lactic acid bacteria *L. plantarum* T14 and *L. plantarum* T35 are indigenous lactic acid bacteria isolated from traditional fermented foods capable of growing on Goat milk medium. although the growth of *L. plantarum* T35 was less than optimal due to the higher initial cell count of 7.93 logs.

In the process of making goat milk yogurt, it is necessary to make better yogurt formulations, such as the addition of skim milk which is not too much. This will create a more conducive environment for microbes to carry out fermentation. In addition, the addition of too many starter cultures should also be avoided. The recommended number of bacteria logs is 6-7 logs of bacteria.

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References
[1] National Agency for Drug and Food Control of the Republic of Indonesia 2005 Regulation of the Head of the Food and Drug Administration of the Republic of Indonesia concerning Basic Provisions for Functional Food Control. Jakarta (ID): Food and Drug Administration
[2] Kraus A 2015 Development of functional food with the participation of the consumer Motivators for consumption of functional prod- ucts. *Int. J. Consum. Stud.* 39: 2–11 http://dx.doi.org/10.1111/ijcs.12144
[3] Sari N K 2017 Development of Soygurt Fermented Beverage Products with the Addition of The Green Extract (*Camellia sinensis*) at PT Fajar Taurus, East Jakarta Essay Faculty of Agricultural Technology Agricultural Institute Bogor
[4] Cossu M, Pisu R, Juliano C C and Alamanni M C P 2009 Effects of enrichment with polyphenolic extracts from Sardinian plants on physico-chemical antioxidant and microbiological properties of yogurt *Italian Journal of Food Science* 21(4). 447–459
[5] INS 2009 Indonesian National Standard INS No 01- 2981-2009: Yogurt Jakarta (In Indonesia)
[6] Pangribowo S 2020 Stay Productive to Prevent and Overcome Diabetes Infodatin Data and Information Center of the Ministry of Health of the Republic of Indonesia Jakarta
[7] Limanto A 2017 Stevia a Sugar Substitute Sweetener from the *Stevia rebaudiana* Plant *Meditek Medical Journal* 23(61)
[8] Be Miller J N 2019 Carbohydrate and Noncarbohydrate Sweeteners *Carbohydrate Chemistry for Food Scientists* 371–399
[9] Marwah M P, Yustina Y S and Murti T W 2010 Production and composition of Ettawa crossbreed goat milk supplemented with katu leaves (*Sauropus androgynus* (L.) Merr) at the beginning of the lactation period. *Animal Husbandry Bulletin* 34(2) 94-102
[10] Dwi 2017 New Potential Goat milk in Sleman https://radarjogja.jawapos.com/breaking-news/2017/03/30/milk-goat-pe-potential-new-in-sleman
[11] Setyaningrisih D, Apriyantono A and Sari M P 2010 *Sensory Analysis for the Food and Agro Industry* IPB Press Bogor
[12] Association of Official Analytical Chemistry 2005 *AOAC Official Method* 968.12 *Sampling of Dairy Products* 18th Edition Chapter 33101
[13] Sugandi E and Sugianto 1994 Experimental Design of Application Theory Andi Offset Yogyakarta
[14] Harismah K, Azizah S, Sarisdianty M and Fauziyah R N 2010 The potential of stevia as a non-calorie sweetener in yogurt
[15] Lisak K, Jelcic I, Tratnik L and Bozanic R 2011 Influence of sweetener stevia on the quality of strawberry flavoured fresh yogurt Mljekarstvo 61(3) 220-225
[16] Weber A and Hekmat S 2013 The effect of stevia rebaudiana on the growth and survival of Lactobacillus rhamnosus GR-1 and sensory properties of probiotic yogurt Journal of Food Research 2(2) 136-142
[17] Aristya A L A, Legowo M and Al-Baarr A N 2013 Physical characteristics chemistry and microbiology of goat milk kefir with the addition of different types and concentrations of sugar Journal of Food Technology Applications 2(3) 139-143
[18] Damunupola D A P R, Weerathilake W A D V and Sumanasekara G 2014 Evaluation of Quality Characteristics of Goat Yogurt Incorporated with Beetroot Juice International Journal of Scientific and Research Publications 4(10)
[19] Rachmawati G F 2019 The Effect of the Addition of Lactobacillus plantarum-pentosus T14 and Lactobacillus plantarum T35 Bacteria and the Concentration of Sucrose on Chemical Characteristics Microbiological and Sensory Fermented Goat Milk Essay Gadjah Mada University Yogyakarta
[20] Tursina, Irfan and Haryani S 2019 Panelists Acceptance Rate of Yogurt with Long Fermentation Treatment Milk Types and Different Storage Periods Scientific Journal of Agricultural Students 4(3)
[21] Rachman A, Taufik E and Arief I I 2018 Characteristics of Rosella Probiotic Yogurt Made From Goat milk and Cow's Milk During Room Temperature Storage Journal of Animal Production Science and Technology 6(2) 73-80
[22] De Santis D, Giacinti G, Chemello G and Frangipane M T 2019 Improvement of the Sensory Characteristics of Goat Milk Yogurt Journal of Food Science
[23] Budiarsana I G M and Sutarna I K 2001 Production Efficiency of Etawa Cross-breed Goat Milk Animal Research Institute Bogor
[24] Barrionuevo M, Alferez M J M, Aliaga L L, Sampelayo M R S and Campos M S 2002 Benefecial effect of Goat milk on nutritive utilization of iron and copper Ni malabsorption syndrome J Dairy Sci. 85 657-664
[25] Tamime A Y and Robinson R K 2000 Yogurt Science and Technology Woodhead Pulishing Limited in Food Science and Technology
[26] Bibiana I, Joseph S, and Julius A 2014 Physicochemical. Microbiological.and Sensory Evaluation of Yogurt Sold in Makurdi Metropolis. African Journal of Food Science and Technology 5(6)129-135
[27] Rahayu E S, Djaafar T F, Wibowo J and Sudarmadji S 1996 Lactic Acid Bacteria from Indigenous Fermented Foods and Their Antimicrobial Activity. Journal Indonesian Food and Nutrition Progress 3 (2)
[28] Djaafar T F, Cahyanto M N, Santoso U and Rahayu E S R 2013 Growth of Indigenous Lactic Acid Bacteria Lactobacillusplantarum-pentosus T35 in Kerandang (Canavalia virosa) Milk and Changes of Raffinose Malaysian Journal of Microbiology 9(3) 213-218
[29] Corrieu G and Beal C 2016 Yogurt: The Product and its Manufacture In: Caballero B Finglass P and Toldra F The encyclopedia of Food and Health 5 Oxford: Academic Press