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CHARACTERISTICS OF MILK CARAMEL CANDY WITH THE ADDITION OF STEVIA *(STEVIA REBAUDIANA BERTONI)* EXTRACT LEAF POWDER

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ABSTRACT

The aime of this study was to determine the characteristics of milk caramel candy with the addition of stevia extract leaf powder (*Stevia rebaudiana Bertoni*) based on the physical, chemical properties, and level of acceptance of the panelists for milk caramel candy. The addition of stevia extract leaf powder to the milk caramel candy was expected to be reduce the value. This study used a completely randomized design (CRD) with 5 treatments and 3 replications. Data analysis using ANOVA and further testing of DNMRT at a 5% significance level. The treatments in this study were the level of addition of stevia extract leaf powder is A (0%), B (0.1%), C (0.2%), D (0.3%), and E (0.4%). The results showed that the addition of different stevia extract leaf powders in milk caramel candy was significantly different at the 5% level on the analysis of the water content, protein content, energy, antioxidant activity, color analysis, organoleptic tests (color, and taste) and the level of addition of stevia extract leaf powder was not significantly different at the 5% level on ash content, fat content, reducing sugar, hardness analysis and organoleptic (aroma and texture) analysis. The best treatment in this study was addition of 0.2% stevia extract leaf powder, the results of chemical analysis showed that the average water content was 9.28%, ash content was 1.87%, protein was 13,91%, fat was 9,69%, reducing sugar was 8.21%, energy value (calories) 403,86 cal/g, antioxidant activity 43.04%, physical analysis of hardness 89.40 N/cm2, color 126.88 ºHue, and organoleptic test results were color 4.35 (like), aroma 3.65 (like), taste 4.25 (like), and texture 3.85 (like).

Keywords: *Characteristics, stevia extract leaf powder, milk caramel candy, physical and chemical characteristics.*

INTODUCTION

Milk is one of the most perfect foodstuffs and is a natural food for newborn mammals as well as the only source of life-giving food after birth (Muchtadi, T. R., Sugiyono., F. Ayustaningwarno, 2010). According to Meutia et al. (2016) stated that milk is a liquid derived from the udder of the healthy and clean dairy livestock, obtained by proper milking and by applicable regulations. Fresh milk is a food with

high nutritional value that is needed by humans because it contains complete and balanced food substances such as carbohydrates (lactose), proteins, fats, minerals, and vitamins (Claeys et al., 2014). The composition of milk general, is 87.2% water, 3.7% milk fat, 3.5% protein, 4.9% lactose, and 0.7% ash. This composition varies depending on the diet, the breed, and the place of life (Prasetya, 2012).

According to Wulandari et al. (2017) that some causes of milk damage can be caused by several factors such as contamination of microorganisms, the activity of enzymes that result in changes in the composition of milk, and water content that greatly affects the shelf life of milk due to water that helps microbial growth, heating and cooling temperatures (heating with too high a temperature and freezing can cause protein damage) which can cause physical changes in milk so that it becomes unsuitable for consumption. Therefore, it is very important to diversify this dairy product so that it can maintain the quality of milk and considering that people are very fond of various innovative and healthy diversified products.

One of the innovative products in dairy preparations is milk caramel candy. Faradillah, Hintono, and Pramono (2017) stated that milk caramel candy is a type of soft non-crystalline candy made from milk and sugar, margarine, and additional dyes and flavors as flavor enhancers heated to a temperature of 120°C. Sucrose is the most commonly used ingredient for the manufacture of this milk caramel candy product.

The use of sucrose in the manufacture of milk caramel candy makes the calories produced by milk caramel candy very high. Sucrose is used as a sweetener that has a fairly high-calorie content, namely 1 g of sucrose contains calories of 4 calories (Beverage Institute Indonesia, 2013). Consuming sucrose too often can result in dental caries, in addition to excessive consumption of sucrose can also be diabetes and obesity. Based on the use of sucrose in the research formula (Koswara, 2009), as many as 20% have a caloric value of 5,206.65 kcal / g (Faradilah, Hintono, and Pramono, 2017). Therefore, it is necessary to look for efforts to make low-calorie milk caramel candy, one of which is by reducing the use of sucrose and using low-calorie sweeteners.

Stevia leaf (Stevia Rebaudiana Bertoni) is a plant that has been widely used as a low-calorie sugar substitute in various types of foods. Stevia leaves can be used as an alternative in making low-calorie natural sugar because they contain glycoside which has a sweet taste but produces low calories. Glycoside which is used commercially is called stevioside which gives a sweet taste of 200 – 300 times that of sucrose sugar (sugarcane) but the calories are low, where the calorific value in dry stevia is 2.42 kcal / g (Djajadi, 2014). For every 0.1 g of stevia sweetener, it is equivalent to 20 g of sucrose (Isdianti, 2007). Stevia also works as a natural antioxidant ingredient. Thomas and Glade (2010) report the ability of stevia leaves to bind free radicals and superoxides, thereby minimizing the development of cancer cells. According to Umami (2015) that the addition of stevia leaf extract can increase the antioxidant activity of the product and the panelists' preference for the product both in terms of color and taste.

Based on the above statement, it can be seen that the use of sucrose in the research formula by (Koswara, 2009) namely as much as 20% has a caloric value in the milk caramel candy produced, which is

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5,206.65 kcal / g. For this reason, in this study, modifications were made to the use of sucrose in the formula for making milk caramel candy in the study. From the results of pre-studies that have been carried out for this study that the concentration of sucrose needed to form milk caramel candy is at least 8%, with the resulting product in terms of sensory taste not so sweet. For this reason, it is necessary to add natural sweeteners to add sensory, namely both in terms of taste, color, and antioxidant character, namely by adding stevia leaf extract powder (Stevia Rebaudiana Bertoni). Untuk itu penulis pada pembuatan permen karamel susu kali ini menggunakan sukrosa dengan konsentrasi yaitu sebanyak 8% dan penambahan bubuk ekstrak daun stevia (*Stevia Rebaudiana* Bertoni) dengan konsentrasi yang berbeda mulai dari 0 %, 0,1 %, 0,2 %, 0,3 %, 0,4 %.

Based on this, the author is interested in conducting a study with the title "Characteristics of Milk Caramel Candy with the Addition of Stevia Leaf Extract Powder (Stevia Rebaudiana Bertoni)".

EXPERIMENTAL SECTION

A. Material

The materials used in this study are fresh cow's milk from PT Moosa Genetika Farmindo in Solok Regency, stevia leaf extract powder derived from fresh stevia leaves obtained from Alahan Panjang in Solok Regency, granulated sugar, salt, and margarine. The materials used for chemical analysis are 96% ethanol, NaOH solution (Sodium Hydroxide), H2SO4 (Sulfuric Acid), DPPH Reagent (2,2-Diphenyl-1-Picrilhydrazyl), HCl (Hydrogen Chloride), KI (Potassium Iodide), selenium mix, hexane solvent, Pb-acetate, (NH4)2HPO4, aquades, Luff-Schoorl solution, sodium thiosulfate, silica gel, and some other analysis materials.

The tools used during the study were stoves, sieves, teflon pans, thermometers, digital scales, wood stirrers, filter paper, measuring cups, molds, plastic containers, and oil paper. While the tools used for analysis are ultrasonic bath (Elma – Elmasonic S 30 H), rotary evaporator (Buchi, B-ONE), spectrophotometer (HACH DR 2700), oven (Memmert 0º - 200 ºC), desiccator, furnace (Nebertherm, more than hend 30 - 300), water bath (Memmert, WB 10WNB), Hunter Lab (Color Flex Ez, CFEZ 0725), Texture Analyzer (Brookfield, CT3), aluminum cup, kjedahl flask, drip pipette, drip pipette, litmus paper, fat flask, timbel paper, fat-free cotton, erlenmeyer, water bath, measuring flask, filter paper, burette, funnel, porcelain cup, stopwatch, hot plate, distillery, and analytical scales.

B. Method of Research

This study used a Complete Randomized Design (RAL) with 5 treatments and 3 repeats. Observational data are analyzed using fingerprints. If F counts are significantly different continued with the DNMRT Advanced Test (Duncan's New Multiple Range Test) at a real level of 5 %. The treatment in this study is the addition of stevia leaf powder in the manufacture of milk candy, which is the formulation of making milk candy with the comparison of the addition of stevia leaf powder based on pre-research that has been carried out, namely as follows:

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A = Addition of stevia leaf powder 0 % of the total milk used

B = Addition of stevia leaf extract powder 0.1 % 0 % of the total milk used

C = Addition of stevia leaf extract powder 0.2 % 0 % of the total milk used

D = Addition of stevia leaf extract powder 0.3 % 0 % of the total milk used

E = Addition of stevia leaf extract powder 0.4 % 0 % of the total milk used

The formulation of the ingredients used in the process of making milk candy is based on the research formula (Koswara, 2009) with modifications can and based on preliminary research that has been carried out as seen in the following Table 1.

Table 1. Milk Caramel Candy Formula

	A	**B**	**C**	**D**	**E**
Susu sapi (ml)	500	500	500	500	500
Gula Pasir (g)	40	40	40	40	40
Garam (g)	1	1	1	1	1
Margarin (g)	1	1	1	1	1
Bubuk Ekstrak daun stevia (g)	0	0,5	1	1,5	2

C. Research Implementation

Manufacture of Stevia Leaf Extract Powder (Kurniawan, 2012 modified)

Separated freshly harvested stevia leaves with the stem. After that, it is served at room temperature for 12 hours. After withers weighed 100 g of simplia and put in an erlenmeyer. Then 1 L of 96% ethanol was added. Furthermore, it is placed into an ultrasonic bath for 2 hours and set the temperature to be 45°C - 60° C. After it is separated between the leaves and the filtrate. Then the filtrate obtained is put into the rotary evaporator flask to evaporate the solvent in the filtrate, which is with a temperature of 50° C. Then stevia leaf extract is obtained (dissolved maltodextrin as much as 10% of the stevia extract obtained before being put in the oven). Furthermore, the stevia extract obtained is dried in the oven at a temperature of 55 °C for 24 hours.

Milk Caramel Candy Making (Modified Koswara, 2009)

Heated 500 ml of fresh milk in a saucepan on the stove slowly until the volume is only half of its initial volume. Then the milk is cooled until it reaches room temperature, then added sugar, margarine, and salt and then stirred until homogeneous, then heated to the stove until cooked. When the milk mixture has begun to thicken, the stove fire is reduced (ascertained that the temperature has reached 60 °C) then the stevia leaf powder is put in according to the treatment, and stirred continuously until cooked. When it is ripe (see maturity test notes below). Then the dough is lifted and put into a mold, and allowed to stand

until it cools and hardens. Cut the dough after hardening with a knife according to the desired shape and size. Then it is packed with oil paper

D. ANALYSIS PROCEDURE

Water Content of Gravimetric Method (Yenrina, 2015)

Dried the Aluminum dish in the oven at a temperature of 105ºC for 10 minutes, then cooled on the desiccator for 10 minutes, and then weighed (W0). A sample of 5 g was weighed in an aluminum dish whose empty weight was known (W1). Then dried in the oven with a temperature of 105ºC for 6 hours, then cooled in a desiccator for 15 minutes, and weighed until a constant weight (W2) is obtained. It is re-dried in the oven until a constant weight is obtained. The calculation is as follows:

$$KA(\%\ b/b) = \frac{\mathrm{W1} - \mathrm{W2}}{W1 - W0} X\ 100\ \%$$

Ash content analysis (Yenrina, 2015)

Prepare a canal dish, then dry in a kiln for 15 minutes then cool in a desiccator and weigh. Weigh the sample as much as 3-5 g in the saucer then burn it on a hot plate until it does not smoke. Put it in a canning kiln, and burned until gray ash is obtained or until the weight remains. Gasping is carried out in the first two stages at a temperature of about 400○C and the second at a temperature of 550○C. Cool in a desiccator then weigh. The ash content is calculated using the formula:

$$\%\ \text{Kadar Abu} = \frac{(\text{berat abu} + \text{cawan}) - (\text{berat cawan})}{\text{berat sampel}} X\ 100\%$$

Protein Levels (Sudarmadji et al., 2007)

The sample was weighed as much as 1 g and put into a 100 mL kjeldahl flask. Added 2 g selenium mix and 15 mL of concentrated H2SO4, then instructed in an acidic room until the solution is clear, continued heating for 1 hour and cooled. Then it is diluted with aquades in a measuring flask of 100 mL. It was done by adding 20 mL of NaOH 50%. The distillation result was accommodated with boric acid 10 mL and 3 drops of methyl red/ methyl blue indicators (a mixture of 2 parts 0.2% methyl red and 1 part 0.2% methyl blue in methanol 95%). Distillation is carried out until the shelter reaches 100 mL. Then titrated the distillation results with an HCl of 0.06944 N until pink color is formed. The result obtained is the total nitrogen which is then expressed in proteins with a conversion factor and the same is done to the blanks. Calculation of protein content:

$$\%N = \frac{(\mathrm{A} - \mathrm{B})\ \times\ \mathrm{NHCl}\ \times\ 14{,}007\ \mathrm{x\ FP}}{\text{berat sampel (mg)}} \times 100$$

Kadar protein = % N x Faktor konversi

Fat Content of Soxhlet Method (AOAC, 2005)

Drained fat flask using the oven for 15 minutes at a temperature of 105ºC, then cooled in a desiccator for 15 minutes and weigh (A). The sample was weighed as much as 5 g (B) and then wrapped in thybel paper and covered with a fat-free cotton swab, then put into a Soxhlet extraction tool that had been connected to a fat flask that had been inventoried and known in weight. Then pour the hexane solvent until the sample is submerged and reflux or extraction of fat is carried out for 5 – 6 hours or until the fat solvent that comes down to the fat flask is clear in color. The fat solvent that has been used is then distilled and accommodated after which the fat extract present in the fat flask is oven-dried at a temperature of 100-105 ºC until the weight is constant. Then cool the fat flask in a desiccator for 15 minutes and weigh (C). The stage of drying fat flasks is repeated until a constant weight is obtained. Fat content can be determined by the formula:

$$\text{Lemak total (\%)} = \frac{\text{Berat labu dan lemak hasil ekstraksi(g)} - \text{beratlabu lemak (g)}}{\text{berat sampel (g)}} X\ 100\%$$

Reduction of sugar content (calculated as inversion sugar) (BSN, 2008)

Weighed 2 g of the sample and put in a 100 mL measuring flask, then a solution of aquades is added and shaken. As for obtaining the sugar value before is taken as much as 10 mL from the measuring flask and put in an erlenmenyer, then added an aquades solution of 15 mL and a Luff-Schoorl solution of 25 mL after which it is heated for 10 minutes, then cooled, when it is cold then added ki solution (20 %) as much as 15 mL, H2SO4 solution (25 %) as much as 25 mL, and amilum (1 %) as much as 5 drops, then titrated with a solution of sodium thiosulfate (0.1 N) until it is milky white. Meanwhile, to get the sugar value after is taken as much as 50 mL from the measuring flask and added HCl solution (6.67 %) as much as 10 mL, then put it into a water bath at a temperature of 70 ºC for 10 minutes, then cooled, when it is cold put a solution of PP solution (1 5) as much as 5 drops, and plus a solution of NaOH (20 %) continues until it is light pink, then put in a measuring flask and added aquades solution until the tera mark, taken as much as 10 mL from the measuring flask and put in an erlenmenyer, then added 15 mL of aquades solution and 25 mL of Luff-Schoorl solution after which it is heated for 10 minutes, then cooled, if it is cold, then 15 mL of KI solution (20 %) is added, H2SO4 solution (25 %) is 25 mL, and amilum (1%) is added as much as 5 drops, then titrated with sodium thiosulfate solution (0.1 N) with a 0.5% kanji solution indicator (V1). Work on the determination of blanks with 25 mL of water and 25 mL of Schoorl Luff solution as in the above way (V2).

Account:

$$\text{Sugar reduction (\%), as sugar before inversion} = \frac{\text{W1 x Fp}}{\text{W}} x\ 100\%$$

Measurement of energy value (calorie) (Almatsier, 2010)

The calculation of the value of energy (calorie) can be obtained from the result of the value of the content of carbohydrates, fats, and proteins. As for 1 g of fat, which produces a value of 9 kcal while 1 g of protein and 1 g of carbohydrates each contain a value of 4 kcal.

GE = fat value (x 9) + protein value (x 4) + carbohydrate value (x 4)

Antioxidant Activity (Hasibuan, 2011)

For testing antioxidant activity as much as 1 mL of sample is then added 10 mL of methanol which is calculated as 100,000 ppm obtained from 1 g / 10 ml = 1000 mg / 0.01 L). then vortexed and laid out on an ultrasonic batch for 15 min. Then diluted until clear. Then take as much as 2 mL then added 1 mL of DPPH solution then let it stand in a dark room for 15-20 minutes. Then the absorbance is measured at a wavelength of 517 nm.

The antioxidant activity of the sample is determined by the magnitude of the resistance to the absorption of DPPH radicals through the calculation of the percentage of INHIBITION of DPPH absorption using the formula:

$$\% \text{ Inhibition } = \frac{\text{Blank Absorbance} - \text{Sample Absorbance}}{\text{Blank Absorbance}} X\ 100\%$$

Violence (Hermansyah, 2010)

The hardness test was carried out using the Brookfield Texture Analyzer tool type CT3 with units of N/cm2. In the product, hardness measurement is carried out by sticking a Texture Analyzer needle 1 mm deep into the sample so that the hardness of the product is known.

$$Poduct\ hardness\ (N/cm3) = \frac{Numbers\ that\ appear\ on\ the\ tool\ \ (N)}{2a}$$

RESULTS AND DISCUSSION

Raw Material Analysis

The antioxidant activity of stevia leaf extract powder can be tested using the DPPH method with UV-Vis spectrophotometry at a maximum wavelength of 517 nm. At a concentration of 100 ppm % inhibition of stevia leaf extract powder obtained is 86.66%. If you continue with the search for IC50 values with concentrations of 25, 50, 75, and 100 ppm stevia leaf powder, you get 35.96.

The smaller the IC value50 the higher the activity to ward off free radicals. In this study, the results of the antioxidant activity of stevia leaf extract powder with an IC50 value were obtained. The resulting product is 35.96 ppm, which is classified as a very strong antioxidant. The same thing was also obtained based on research conducted by Mutmainah et al. (2018) that the value of the antioxidant activity

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of stevia leaf extract on the IC value 50 the obtained value is 48.18 which is an antioxidant belonging to a very strong group as well.

Moisture Content

The results of the analysis of the water content in this milk caramel candy can be seen in table 2 below.

Table 2. Average Value of Water Content Analysis of Milk Caramel Candy.

Treatment (Addition of Stevia Leaf Extract Powder)	**Value of Moisture Content (%) (Average ± SD)**
E (Addition of 0.4% Stevia Leaf Extract Powder)	9.14±0.01 a
D (Addition of 0.3% Stevia Leaf Extract Powder)	9.22±0.04 b
C (Addition of 0.2% Stevia Leaf Extract Powder)	9.28± 0.01 b
B (Addition of 0.1% Stevia Leaf Extract Powder)	9.38±0.06 c
A (Addition of 0% Stevia Leaf Extract Powder)	9.4±0.04 d
KK : 0.34%	

Note: The numbers in the same column followed by lowercase letters are not the same, significantly different at the 5% Duncan's New Multiple Range Test (DNMRT) levels.

Based on the results of table 2, shows that the addition of stevia leaf powder was statistically significant ($\alpha<0.05$) in the water content of the milk caramel candy produced. It can be seen that the results of the water content in the milk caramel candy produced ranged from 9.14% - 9.46%. The higher the concentration of stevia leaf powder, the lower the water content of the milk candy produced. This is because the increase in the concentration of stevia leaf extract powder causes the proportion of milk in the ingredients to decrease so that the dominant water content of milk which was previously 88.3% (Depkes RI, 2005) is also reduced. The results obtained from this study are in line with Nasution (2018) who states that the decrease in the water content of dried papaya candied is caused by the addition of stevia leaf extract powder. The same thing was also obtained by Sriwahyuni (2017) that the average value of water content in ice cream with the addition of stevia leaf extract powder tends to decrease. In a study conducted by Sri et al. (2021) that there was also a decrease in water content after stevia was given to pedada fruit juice drinks.

According to the quality standard of SNI 3547-2-2008, which is about the quality requirements of soft confectionery, the maximum water content is 7.5%. Based on the results, the average water content value obtained in this study did not meet the SNI standard, which could be influenced by the modification of sugar (sucrose) carried out in this study, namely the use of sucrose only as much as 8%. As for the research formula, Koswara (2009) used sucrose as much as 20%, the results of the analysis of the water content of milk caramel candy with an average value of 7.05% where the results obtained are by the existing SNI standards, which is a maximum of 7.5%. It can be seen that sugar (sucrose) has hygroscopic

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properties, meaning that sucrose can bind water so that it can reduce the water content of foodstuffs (Kartika and Fithri, 2015).

Ash Content

The results of the analysis of the ash content in this milk caramel candy can be seen in table 3 below.

Table 3. Average Value of Ash Content Analysis of Milk Caramel Candy.

Treatment (Addition of Stevia Leaf Extract Powder)	**Ash Content Value (%) (Average ± SD)**
A (Addition of 0% Stevia Leaf Extract Powder)	1.83 ± 0.02 a
B (Addition of 0.1% Stevia Leaf Extract Powder)	1.84 ± 0.02 a
C (Addition of 0.2% Stevia Leaf Extract Powder)	1.87 ± 0.01 b
D (Addition of 0.3% Stevia Leaf Extract Powder)	1.91 ± 0.01 c
E (Addition of 0.4% Stevia Leaf Extract Powder)	1.96 ± 0.01 d
KK : 0.65%	

Note: The numbers in the same column followed by lowercase letters are not the same, significantly different at the 5% Duncan's New Multiple Range Test (DNMRT) level

Based on the results of table 3 shows that the addition of stevia extract powder was statistically significant ($\alpha<0.05$) on the ash content of the milk candy produced. It can be seen that the results of the ash content in the milk candy produced ranged from 1.83% - 1.96%. The higher the concentration of stevia leaf extract powder, the higher the ash content of the milk caramel candy obtained, this is because the ash content of the stevia leaf extract powder is 11% higher (Mishra et al., 2010) compared to the ash content in milk. by 0.72% (Almatsier, 2002).

The increase in the concentration of the added stevia leaf powder causes the proportion of milk to decrease so that the ash content obtained increases. The results obtained from this study are in line with the research conducted by Indry et al. (2020) that there was an increase in the ash content of fig leaf tea caused by the addition of stevia leaves, and the same thing was also obtained by Nasution (2018) which stated that an increase in the ash content of dried candied papaya was caused by the addition of stevia leaf powder. According to Kim et al. (2002) stated that the stevia leaf contains minerals such as phosphorus, iron, calcium, potassium, sodium, and magnesium. Based on the quality standard of SNI 3547-2-2008, which is about the quality requirements of soft confectionery that the maximum ash content is 2%.

Protein Content

The results of the analysis of protein levels in milk caramel candy can be seen in table 4 below.

Table 4. Average Value of Milk Candy Protein Content Analysis.

Treatment (Addition of Stevia Leaf Extract Powder)	**Value of Protein Content (%) (Average ± SD)**
A (Addition of 0% Stevia Leaf Powder)	13.72 ± 0.03 a
B (Addition of 0.1% Stevia Leaf Extract Powder)	13.83 ± 0.02 b
C (Addition of 0.2% Stevia Leaf Extract Powder)	13.91 ± 0.02 c
D (Addition of 0.3% Stevia Leaf Extract Powder)	14.12 ± 0.02 d
E (Addition of 0.4% Stevia Leaf Extract Powder)	14.19±0.01 e
KK : 0.12%	

Note: The numbers in the same column followed by lowercase letters are not the same, significantly different at the 5% Duncan's New Multiple Range Test (DNMRT) level

Based on the results of table 4 shows that the addition of stevia leaf extract powder was statistically significant ($\alpha<0.05$) on the protein content of the milk caramel candy produced. It can be seen that the results of the protein content in the milk caramel candy produced ranged from 13.72% - 14.19%. The higher the concentration of stevia leaf extract powder, the higher the protein content of the milk caramel candy produced, this is because the protein content of the stevia leaf extract powder is 10% higher (Mishra et al., 2010) compared to the protein content in milk, namely by 3.2%(Depkes RI, 2005).

The results obtained in this study are in line with Widodo et al. (2015) that there was an increase in protein in Bio-yogurt along with the addition of stevia.As based on research conducted by Abouarab et al. (2010) it is known that stevia leaves contain various kinds of proteins in the form of essential amino acids, namely arginine, lysine, histidine, phenyl alianine, laucine methionine, valine, theorinin, isosol, and non-essential amino acids, namely aspartate, serine, glutamate, proline, glycine, alanine, cystine, and tyrosine.

Fat Content

The results of the analysis of fat content in milk caramel candy can be seen in table 5 below.

Table 5. Average Value of Fat Content Analysis of Milk Caramel Candy

Treatment (Addition of Stevia Leaf Extract Powder)	**Value of Fat Content (%) (Average ± SD)**
A (Addition of 0% Stevia Leaf Extract Powder)	9.60±0.01 a
B (Addition of 0.1% Stevia Leaf Extract Powder)	9.65±0.04 b
C (Addition of 0.2% Stevia Leaf Extract Powder)	9.69±0.02 b
D (Addition of 0.3% Stevia Leaf Extract Powder)	9.75±0.02 c
E (Addition of 0.4% Stevia Leaf Extract Powder)	9.82±0.03 d
KK : 0.32%	

Note: The numbers in the same column followed by lowercase letters are not the same, significantly different at the 5% Duncan's New Multiple Range Test (DNMRT) level

Based on the results of table 5 shows that the addition of stevia leaf extract powder was statistically significant ($\alpha<0.05$) on the fat content of the milk caramel candy produced. It can be seen that the results of the fat content in the milk caramel candy produced ranged from 9.60% - 9.82%. The higher the concentration of stevia leaf extract powder, the higher the fat content of the milk caramel candy produced. This is because the stevia leaf extract powder contains a fat content of 3.73% (Abouarab et al., 2010) the fat content in milk is 3.5%(Depkes RI, 2005) and the fat content in margarine is 81% (Saramoya, 2015). This is to the research obtained by Sri et al. (2021) that there was an increase in fat content in pedada fruit juice drinks along with the addition of stevia, andWidodo et al. (2015) also found that there was an increase in fat content in Bio-yogurt along with the addition of stevia.

Reducing Sugar

The results of the analysis of reducing sugar in milk caramel candy can be seen in table 6 below.

Table 6. Average Value of Reducing Sugar Analysis of Milk Caramel Candy

Based on the results of table 6, shows that the addition of stevia leaf extract powder was statistically significant ($\alpha<0.05$) on the value of the reducing sugar analysis carried out, namely the results obtained ranging from 7.90% - 8.40%. The higher the concentration of stevia leaf powder, the lower the reducing sugar content of the milk caramel candy produced. This is because the sugar from milk in the form of lactose is also reduced where lactose is a component that gives sweetness to cow's milk which contains 4% lactose (Sinuhaji, 2006). So that the more the concentration of stevia leaf extract powder was added, the milk concentration and reducing sugar content also decreased.

According to (Budiyanto, 2002) that reducing sugar content is related to the process of breaking down sucrose into glucose and fructose which is influenced by the reaction of acid, heat, and mineral

content during cooking (hydrolyzed). According to the quality standard of SNI 3547-2-2008, which is about the quality requirements of soft confectionery the maximum reducing sugar content is 20%. Based on the results of the average value of reducing sugar content obtained in the study of milk caramel candy with the addition of stevia leaf powder, it meets the SNI standard.

Energy Analysis (calories)

The results of the energy analysis (calories) in this milk caramel candy can be seen in table 7 below.

Table 7. Average value of energy analysis (calories) milk caramel candy

Treatment (Addition of Stevia Leaf Extract Powder)	**Energy Value (cal/g) (Average ± SD)**
A (Addition of 0% Stevia Extract Leaf Powder)	402.85±0.18 a
B (Addition of 0.1% Stevia Extract Leaf Powder)	403.54± 0.46 ab
C (Addition of 0.2% Stevia Extract Leaf Powder)	403.86±0.16 b
D (Addition of 0.3% Stevia Extract Leaf Powder)	403.88± 0.69 b
E (Addition of 0.4% Stevia Extract Leaf Powder)	404.67±0.12 c
KK : 0.003%	

Note: The numbers in the same column followed by lowercase letters are not the same, significantly different at the 5% Duncan's New Multiple Range Test (DNMRT) levels

Based on the results of table 7, shows that the addition of stevia leaf extract powder was statistically significant ($\alpha<0.05$) on the energy value (calories) in milk caramel candy, that is, the results ranged from 402.85 cal/g – 404.67 cal/g. . The higher the concentration of stevia leaf extract powder, the higher the energy content (calories) of the milk candy produced. This is due to the increase in the concentration of the added stevia leaf extract powder, namely, stevia also has a calorific value of 2.42 kcal/g, where the calorific value of stevia is lower than cane sugar which is 386 kcal/g, and other sweeteners such as aspartame which contains 4 kcal/g (Djajadi, 2014).

Antioxidant Activity

The results of the analysis of the antioxidant activity in milk caramel candy can be seen in table 8 below.

Table 8. Average Value of Antioxidant Activity Analysis of Milk Caramel Candy

Treatment (Addition of Stevia Leaf Extract Powder)	**Antioxidant Activity (%) (Average ± SD)**
A (Addition of 0% Stevia Leaf Extract Powder)	32.89±0.79 a
B (Addition of 0.1% Stevia Leaf Extract Powder)	40.38± 0.19 b
C (Addition of 0.2% Stevia Leaf Extract Powder)	43.04±0.38 c
D (Addition of 0.3% Stevia Leaf Extract Powder)	45.39±0.29 d
E (Addition of 0.4% Stevia Leaf Extract Powder)	49.33±0.91 e
KK : 1.01%	

Note: The numbers in the same column followed by lowercase letters are not the same, significantly different at the 5% Duncan's New Multiple Range Test (DNMRT) level

Based on the results of table 8, shows that the addition of stevia leaf extract powder was statistically significant ($\alpha<0.05$) on the value of inhibition at a concentration of 100 ppm, namely the antioxidant activity value in milk caramel candy was in the range of 32.89% - 49.33 %. The more the concentration of stevia leaf extract powder was added, the higher the antioxidant activity value of the milk caramel candy produced. This is by what was said by Kujur et al. (2010) that stevia leaves contain phytochemical compounds that have the potential as antioxidants, including alkaloids, steroids, and phenolics, as well as small amounts of saponins and tannins. In addition, stevia leaves also contain flavonoid compounds, namely kaempferol, catechins, epicatechin, luteolin, rutin, centrauredin, apigenin, and quesetin which can also function as antioxidants.

When viewed the value of the inhibition of powdered stevia leaf extract with the same concentration at 100 ppm was found to be 86.66%. Here there was a decrease in the inhibition of the stevia leaf extract powder when it was mixed or applied to the resulting milk caramel candy product. According to Reda (2011), Chamorro et al. (2012), and Hihat et al. (2017) that antioxidants are sensitive to thermal processes and high-temperature cooking which can reduce their antioxidant properties and damage the chemical structure of their constituent compounds.

Violence Analysis

The results of the analysis of hardness in milk caramel candy can be seen in table 9 below.

Table 9. Average Hardness Analysis of Milk Caramel Candy

Treatment (Addition of Stevia Leaf Extract Powder)	**Hardness Value (N/cm2) (Average ± SD)**
A (Addition of 0% Stevia Leaf Extract Powder)	88.27±0.25 a
B (Addition of 0.1% Stevia Leaf Extract Powder)	88.83± 0.20 b
C (Addition of 0.2% Stevia Leaf Extract Powder)	89.40± 0.25 c
D (Addition of 0.3% Stevia Leaf Extract Powder)	90.17±0.30 d
E (Addition of 0.4% Stevia Leaf Extract Powder)	90,40±0.25 e
KK : 0.11%	

Note: The numbers in the same column followed by lowercase letters are not the same, significantly different at the 5% Duncan's New Multiple Range Test (DNMRT) levels.

Based on the results of table 9, shows that the addition of stevia leaf extract powder was not statistically significant ($\alpha<0.05$) on the hardness value of the milk caramel candy produced. The more addition of stevia leaf extract powder, the higher the hardness value. Food products will be softer or the texture value will be lower if the water content in them is higher (Midayanto and Yuwono (2014). Based on the water content analysis conducted in this study, the highest water content value was found in treatment A (without the addition of stevia leaf extract powder).) and this is evidenced by the low hardness value produced on milk caramel candy with treatment A (without the addition of stevia leaf extract powder) which is 88.27 N/cm2.

Color analysis

Color testing on milk caramel candy with the addition of stevia leaf powder was measured using a tool, namely Hunterlab which produces 3 color parameters with the notation L*, a*, and b*. According to Kusnandar et al. (2003) stated that the hunter system has three hunter parameters L*, a*, and b*. The L* notation indicates a panel light that produces white, gray, and black colors. The notation a* indicates the chromatic value of red (positive) and green (negative). The b* notation indicates yellow (positive) and blue (negative) chromatic colors, while Hue it shows the proportion of color in the material. Hue values ranged from 18 to 54 red products, 54-90 yellow red products, 90-126 yellow products, 126-162 yellow green products, 162-198 green products, 198-234 blue green products, 234- 270 products in blue, 270-306 products are blue-purple, 306-342 products are purple, 342-18 products are red-purple. The results of the color analysis on this milk candy can be seen in table 10 below.

Table 10. Average Color Analysis of Milk Caramel Candy

Treatment (Addition of Stevia Leaf Extract Powder)	**HUE . Value (Average ± SD)**
A (Addition of 0% Stevia Leaf Extract Powder)	119.70 ± 0.16 a
B (Addition of 0.1% Stevia Leaf Extract Powder)	120.87 ± 0.17 b
C (Addition of 0.2% Stevia Leaf Extract Powder)	126.88 ± 0.52 c
D (Addition of 0.3% Stevia Leaf Extract Powder)	133.88 ± 0.28 d
E (Addition of 0.4% Stevia Leaf Extract Powder)	134.91 ± 0.16 e
KK : 0.22%	

Note: The numbers in the same column followed by lowercase letters are not the same, significantly different at the 5% Duncan's New Multiple Range Test (DNMRT) levels.

Based on the results of table 10, shows that the addition of stevia leaf extract powder was statistically significant ($\alpha<0.05$) on the value of Hue in the milk caramel candy produced. It can be seen that the Hue values obtained ranged from 119.70 - 134.91 which according to the observations obtained, the color of the milk caramel candy produced was yellow to greenish yellow. The higher the concentration of stevia leaf extract powder added, the greener the color of the milk caramel candy produced. The green color obtained in the milk caramel candy is due to the presence of chlorophyll pigment from the stevia leaf extract powder, which is the darker the green color in the stevia leaf extract powder, the higher the chlorophyll content in the stevia leaf.

Organoleptic Test

a. Color

The results of the color organoleptic test analysis on this milk caramel candy can be seen in table 11 below.

Treatment (Addition of Stevia Leaf Extract Powder)	**Color Value (Average ± SD)**
A (Addition of 0% Stevia Leaf Extract Powder)	3.15±0.49 a
E (Addition of 0.4% Stevia Leaf Extract Powder)	3.30±0.66 a
D (Addition of 0.3% Stevia Leaf Extract Powder)	3.45±0.76 ab
B (Addition of 0.1% Stevia Leaf Extract Powder)	3.90± 0.85 bc
C (Addition of 0.2% Stevia Leaf Extract Powder)	4.35±0.93 c
KK : 20.7%	

Note: The numbers in the same column followed by lowercase letters are not the same, significantly different at the 5% Duncan's New Multiple Range Test (DNMRT) level

Based on the results of table 11, shows that the addition of stevia leaf extract powder was statistically significant (α<0.05) on the value of the color organoleptic test analysis on the milk caramel candy produced. It can be seen that the average value obtained ranges from 3.15 to 4.35. This shows that the color of the milk caramel candy produced can be accepted by the panelists at the ordinary to the level of liking. The color of the milk caramel candy produced by the addition of stevia leaf extract powder is yellow to greenish yellow. This is due to the increasing addition of stevia leaf extract powder. The green color is influenced by stevia leaves which are green because of the chlorophyll content in stevia leaves.

b. Aroma

The results of the analysis of the organoleptic aroma test on this milk caramel candy can be seen in table 12 below.

Table 12. The Average Value of the Organoleptic Analysis of Milk Caramel Candy Aroma

Treatment (Addition of Stevia Leaf Extract Powder)	**Aroma Value (Average ± SD)**
E (Addition of 0.4% Stevia Leaf Extract Powder)	3.45± 0.69 a
D (Addition of 0.3% Stevia Leaf Extract Powder)	3.50± 0.69 a
C (Addition of 0.2% Stevia Leaf Extract Powder)	3.65± 0.49 ab
B (Addition of 0.1% Stevia Leaf Extract Powder)	3.98± 0.98 ab
A (Addition of 0% Stevia Leaf Extract Powder)	4.00± 0.65 b
KK : 19.56%	

Note: The numbers in the same column followed by lowercase letters are not the same, significantly different at the 5% Duncan's New Multiple Range Test (DNMRT) levels.

Based on the results of table 12, shows that the addition of stevia leaf extract powder was statistically significant (α<0.05) on the value of the aroma organoleptic test analysis on the milk caramel candy produced. It can be seen that the average value obtained ranges from 3.45 to 4.00. This shows that the color of the milk caramel candy produced can be accepted by the panelists at the ordinary to the level of liking. The factor that caused some panelists to dislike milk caramel candy products with the addition of stevia leaf extract powder at high concentrations because the stevia leaf extract powder had a less fragrant or slightly unpleasant aroma. This is in the opinion of Lawless et al.

c. Taste

The results of the analysis of the taste organoleptic test on this milk caramel candy can be seen in table 13 below.

Table 13. Average Value of Organoleptic Analysis of Milk Caramel Candy Flavor

Treatment (Addition of Stevia Leaf Extract Powder)	**Taste Value (Average ± SD)**
E (Addition of 0.4% Stevia Leaf Extract Powder)	2.45±0.51 a
D (Addition of 0.3% Stevia Leaf Extract Powder)	3.00± 0.79 b
B (Addition of 0.1% Stevia Leaf Extract Powder)	3.95±0.94 c
A (Addition of 0% Stevia Leaf Extract Powder)	4.00± 0.86 c
C (Addition of 0.2% Stevia Leaf Extract Powder)	4.25± 0.64 c
KK : 21.68%	

Note: The numbers in the same column followed by lowercase letters are not the same, significantly different at the 5% Duncan's New Multiple Range Test (DNMRT) levels.

Based on the results of table 13, shows that the addition of stevia leaf extract powder was statistically significant ($\alpha<0.05$) on the value of the organoleptic test analysis of the resulting milk caramel candy. It can be seen that the average value obtained ranges from 2.45 to 4.25. The higher the concentration of stevia leaf extract powder added, the panelists' preference for milk caramel candy decreased. The addition of stevia leaves will strengthen the sensory characteristics of the bitter taste (Suk Hyung, 2017). According to Ahmad, et al. (2019) also said that the taste of a product decreased along with the addition of stevia leaves. This is also by the opinion of Isdianti (2007) that the astringent and unpleasant taste resembles bitterness in the stevioside compound contained in stevia leaves.

Texture

The results of the organoleptic texture analysis on this milk caramel candy can be seen in table 14 below.

Table 14. Average Value of Organoleptic Analysis of Milk Caramel Candy Texture

Treatment (Addition of Stevia Leaf Extract Powder)	**Texture Value (Average ± SD)**
A (Addition of 0% Stevia Leaf Extract Powder)	3.75 ± 0.64 a
B (Addition of 0.1% Stevia Leaf Extract Powder)	3.75 ± 0.55 a
C (Addition of 0.2% Stevia Leaf Extract Powder)	3.85 ± 0.49 a
D (Addition of 0.3% Stevia Leaf Extract Powder)	3.85 ± 0.49 a
E (Addition of 0.4% Stevia Leaf Extract Powder)	3.95 ± 0.69 a
KK : 15.04%	

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Note: The numbers in the same column followed by lowercase letters are not the same, significantly different at the 5% Duncan's New Multiple Range Test (DNMRT) level

Based on the results of table 14, it is shown that the addition of stevia leaf extract powder was not statistically significant ($\alpha<0.05$) on the value of the texture organoleptic test analysis on the milk caramel candy produced. It can be seen that the average value obtained ranges from 3.75 to 3.95. This shows that the color of the milk caramel candy produced can be accepted by the panelists, namely at the usual level. According to Afriandi et al. (2018) the texture of milk caramel candy is related to the water content contained, the higher the water content contained can cause a mushy texture in milk caramel candy, and vice versa if the water content is low it can cause the resulting milk caramel candy texture to be hard.

The Average value of organoleptic testSensory milk candy with the addition of stevia leaf extract powder as a whole in terms of color, aroma, taste, and texture can be seen in Fig. 1

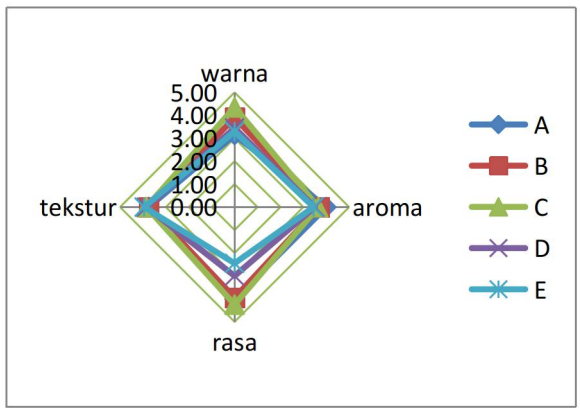

Figure 1. Organoleptic Test Radar Image

Based on the graphic image of the organoleptic test radar, it can be concluded that the best treatment is in treatment C (addition of 0.2% stevia leaf powder) with the average value of the organoleptic test, namely color4.35, aroma 3.65, taste 4.25, and texture 3.85. Overall, the organoleptic test value of milk candy with the addition of stevia leaf powder was acceptable to the panelists in terms of color, aroma, texture, and taste of milk caramel candy produced in all treatments with the addition of added stevia leaf extract powder.

CONFLICT OF INTEREST

The authors had no conflict of interest

CONCLUSIONS

Based on the results of the research that has been done, the following conclusions can be drawn:

1. The addition of stevia leaf extract powder in milk caramel candy gave a significant effect on water content, protein, antioxidant activity, color analysis, and organoleptic tests (color and taste) but did not give a significant effect on ash content, fat content, reducing sugar, energy value (calories),

hardness analysis, and organoleptic tests (scent and texture).

2. The best treatment was treatment C (addition of 0.2% stevia leaf extract powder) with the average parameter of panelists' preference for color 4.35 (like), aroma 3.65 (like), taste 4.25 (like), and texture 3.85 (like) with the results of the analysis of water content 9.28%, ash content 1.87%, protein 13.91%, fat 9.69%, reducing sugar 8.21%, energy value (calories) 403.86 cal/g, antioxidant activity 43.04%, hardness 89.40N/cm2, color 126.88 Hue

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