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Physicochemical Characteristics of Cucumber Sherbet on Various *Pandan Wangi* Juice Concentrations and Sweetener Types

Syarifa Ramadhani Nurbaya[1*], Rima Azara[1], Andriani Eko Prihatiningrum[2], Lukman Hudi[1] and Danya Mozza Elshiva[1]

[1]Department of Food Technology, Faculty of Science and Technology, Universitas Muhammadiyah Sidoarjo, Sidoarjo, Indonesia; [2]Department of Agrotechnology, Faculty of Science and Technology, Universitas Muhammadiyah Sidoarjo, Sidoarjo, Indonesia

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Abstract

Cucumbers can be processed into a frozen snack called sherbet. The problem with using cucumber in sherbet processing is its bland taste. *Pandan wangi* leaves (*Pandanus amaryllifolius* Roxb.) can be used to improve the flavor and aroma of cucumber sherbet. This study aimed to determine the effect of *pandan wangi* juice concentration and sweetener type on cucumber sherbet's physical and chemical characteristics. The study used a factorial randomized group design consisting of 2 factors: the concentration of *pandan wangi* juice (5%, 10%, and 15%) and the type of sweetener (simple syrup, fructose, and honey). The physicochemical characteristics observed in this study include overrun, texture, color (L, a, b), melting time, total dissolved solids, vitamin C content, and total chlorophyll. The interaction between the concentration of *pandan wangi* juice and the type of sweetener significantly influenced the overrun of cucumber sherbet. The concentration of *pandan wangi* juice significantly influenced the texture, greenness (a-), yellowness (b+), and total chlorophyll. The type of sweetener significantly affects the yellowness (b+) value, melting time, and total soluble solids. The best treatment is *pandan wangi* juice with a concentration of 15% and fructose syrup as a sweetener type. *Pandan wangi* juice concentration and sweetener type can improve the characteristics of sherbet in terms of both physical and chemical properties. Cucumber sherbet combined with *pandan wangi* juice and certain sweeteners can be a healthy frozen snack.

Keywords: aroma; formulations; functional foods; healthy food; pandan juice

INTRODUCTION

Cucumber (*Cucumis sativus*) is a local Indonesian commodity that contains dietary fiber and vitamins such as A, B, and C (Uthpala et al., 2020). Cucumber also contains secondary metabolite compounds, namely phytochemical compounds. The phytochemical compounds found in cucumber are alkaloids and flavonoids. Both compounds can function as antioxidants (Agatemor et al., 2018). Cucumbers also contain anticancer components, namely tannins, alkaloids, glycosides, amino acids, phytosterols, steroids, saponins, and terpenoids. These components can inhibit the growth of HeLa and HepaG2 cancer cells (Naureen et al., 2022). Cucumber is widely processed in cosmetics and medicines (Suhartono et al., 2020). In the food

* **Corresponding author**: syarifa@umsida.ac.id

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sector, cucumbers are generally used as a complement to rice salads, ice *kuwut*, pickles, salads (Naureen et al., 2022), and processed into frozen snacks, namely sherbet.

Sherbet is a frozen product made from fruit, water, sweetener, stabilizer, and milk solids. Sherbet contains 1 to 2% milk fat and at least 1% non-fat milk solid (Fayed et al., 2020). The main ingredient in making sherbet is fruit (Amalia et al., 2019). Frozen sherbet is sherbet served frozen, made from fruit, sugar, water, stabilizers, and small amounts of milk solids added to the formulation in the form of whole milk, skim milk, and condensed milk (Aishwariya et al., 2019).

The problem with using cucumber in food processing is that the taste is bland and the aroma is not strong enough. So, other ingredients must be added to improve the taste and aroma. Van Stokkom et al. (2018) combined cucumber purees with a neutral flavor, sucrose/ citric acid/caffeine/MSG/sodium chloride, and sunflower oil. Blend cucumber juice with clove/mint/cinnamon/ginger extract to improve cucumber juice's functional value and sensory characteristics (Saad et al., 2021).

Pandan wangi leaves (*Pandanus amaryllifolius* Roxb.) can be used to improve the flavor and aroma of cucumber sherbet. As the name implies, its aromatic leaves are widely used to enhance the flavor and aroma of food (Bhuyan and Sonowal, 2021). In Indonesia, *pandan wangi* leaves are commonly used in compote when cooking yellow rice and making cakes and wet cakes. The aroma of *pandan wangi* is because the leaves contain compounds derived from phenylalanine amino acids, namely the compound 2-acetyl-1-pyrroline. *Pandan wangi* leaves also have pharmacological activities that are beneficial to health, namely as antioxidants, anticancer agents, and antidiabetics (Dewanti and Sofian, 2017).

The sherbet formulation contains less fat than ice cream. So, in addition to providing sweetness, the sweetener component helps form a soft texture in the sherbet. Generally, the sweetener used in sherbet is simple syrup. Simple syrup is made from a mixture of sugar and water. Sweeteners other than sugar can be used to make sherbet. Sugar substitution using 100% maple syrup produced a sherbet that was most favored by panelists (Mohammed and Mahmood, 2022). However, there is a lack of information regarding the effects of other types of sweeteners, such as honey and fructose syrup, on the characteristics of sherbet. This study aimed to study the impact of *pandan wangi* juice concentration and sweetener type (simple syrup, fructose syrup, and honey) on cucumber sherbet's physical and chemical characteristics.

MATERIALS AND METHOD

Materials

This study used ingredients including cucumber OP variety (obtained from Larangan market, Sidoarjo, Indonesia), *pandan wangi* leaves (obtained from Gelam Village, Sidoarjo, Indonesia), and sugar (*Gulaku*). It also contains skim milk (*Holland*), full cream milk (*Indomilk*), honey (*Nusantara*), and fructose syrup (*Edna*). Materials used for analysis included distilled water (*Brataco*), 0.01 N iodine standard solution (ROFA), 1% amylum solution, and acetone (ACI Labscan).

Preparation of *pandan wangi* juice

Pandan wangi leaves are prepared and washed. Then cut into 2 cm × 1 cm size. Then, steam blanched at 95 °C for 10 seconds. *Pandan wangi* leaves are added to water with the 1:10 (w/v) ratio and mashed at high speed for 2 minutes. Furthermore, filtering is done to obtain *pandan wangi* juice (with modification) (Astuti et al., 2018).

Making simple syrup

Simple syrup is made from sugar mixed with water in a ratio of 1:1 (w/v). Sugar is mixed with water for 3 minutes using medium heat (Trisdayanti et al., 2021).

Cucumber sherbet making

The cucumber is peeled and seeded. Then, cut into 1.5 cm × 1.5 cm pieces and washed thoroughly. The cucumber pieces were steam blanched at 95 °C for 10 seconds. Then, the cucumber pieces were weighed to a certain weight and put into a blender. Ingredients such as skim milk powder 1%, full cream milk powder 1%, carboxymethyl cellulose (CMC) 1%, sweetener (simple syrup, fructose, honey) 20%, and *pandan wangi* juice (5%, 10%, 15%) were also put into the blender. All ingredients are blended. Furthermore, the mixture was heated while stirring to a temperature of 73 ºC for 15 seconds to thoroughly mix and kill pathogenic microbes (Nurjaman and Abidin, 2014). Then, the dough is cooled to room temperature. The dough was

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put into the freezer for 2 hours. After chilling, the dough was mixed at 95 rpm for 10 minutes and frozen for 24 hours at ± -7 °C.

Analysis of physical and chemical properties

Overrun

Overrun can be determined by measuring the sherbet dough and frozen sherbet volume (Lestari et al., 2019, with modifications) (Equation 1).

Texture

The texture (hardness) of the sherbet was measured using a texture profile analyzer (IMADA). The measurement was conducted using a conical probe with a diameter of 2 cm and a height of 2.4 cm. The speed when puncturing the sample is 7 mm second^{-1} (Yudhistira et al., 2024, with modifications).

Color

The sample is placed in a clear container. The colorimeter lens (FRU) is brought close to the sample's clear container. The target button is pressed to measure the color of the sample. The color measurement uses the L, a, b system (L+ = lighter; L- = darker; a+ = red; a- = green; b+ = yellow; b- = blue) (Nurbaya et al., 2021).

Melting time

A 10 g sample was placed on the sieve. A container was placed at the bottom of the sieve. The sample was allowed to thaw at room temperature. A stopwatch measures the time the sample melts completely (Lestari et al., 2019).

Total dissolved solids (TDS)

TDS are measured by placing the sample on the prism of the hand refractometer (Brix 0-33%, ATAGO). Then, the measurement scale on the eyepiece was read (Nurbaya et al., 2021).

Vitamin C content

A 10 g sample was diluted 10 times. Then, the sample was filtered to separate the filtrate. The filtrate was taken as much as 10 ml and put into an erlenmeyer. Then, the sample was added with 1% amylum solution in as much as 2 ml. Then, the sample was titrated using 0.01 N iodine solution until the color of the solution turned a stable dark blue (Kamaluddina and Handayani, 2018). Vitamin C content was calculated using Equation 2.

Total chlorophyll

The sample was weighed as much as 1 g and then mixed with 2 ml of distilled water using a magnetic stirrer. While stirring, 8 ml of acetone was added to it. The sample continued to be stirred using a magnetic stirrer for 1 minute. The sample was centrifuged at 4,500 rpm for 10 minutes. The supernatant portion was put into a cuvette and measured using a spectrophotometer at 663 and 646 nm (Warjoto et al., 2020, with modifications). Chlorophyll content was determined using Equation 3 (chlorophyll a), Equation 4 (chlorophyll b), and Equation 5 (total chlorophyll).

Data analysis

The study used a factorial randomized group design consisting of 2 factors: the *pandan wangi* juice concentration (5%, 10%, 15%) and the type of sweetener (simple syrup, fructose, and honey). Each treatment was repeated 3 times, resulting in 27 experimental units. Data were analyzed using analysis of variance (ANOVA). If there was a significant effect, the data were further tested using the Tukey test ($\alpha = 5\%$) (Nanda et al., 2021). Data were analyzed using Minitab 17 software.

$$\text{Overrun (\%)} = \frac{\text{The volume of sherbet that has frozen-sherbet dough volume}}{\text{Sherbet dough volume}} \text{ x } 100\% \quad (1)$$

$$\text{Vitamin C content (\%)} = \frac{\text{Volume of iodine titration x 0.88 x dilution factor}}{\text{Sample weight (mg)}} \text{ x } 100\% \quad (2)$$

$$\text{Chlorophyll a content} = 12.21\ (A_{663}) - 2.81\ (A_{646})\ \text{mg l}^{-1} \quad (3)$$

$$\text{Chlorophyll b content} = 20.13\ (A_{646}) - 5.03\ (A_{663})\ \text{mg l}^{-1} \quad (4)$$

$$\text{Total chlorophyll content} = 7.18\ (A_{663}) + 17.3\ (A_{646})\ \text{mg l}^{-1} \quad (5)$$

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Selection of the best treatment

The best treatment is selected using the multiple attribute method based on physical and chemical parameters (Akbar et al., 2024). The procedure for selecting the best treatment includes: 1) determine the ideal value of each parameter according to the expectation of a parameter (can be the maximum or minimum value); 2) calculate the degree of density based on the ideal value of each parameter; 3) calculating the density distance (ʎ); and 4) the most negligible value of L1, L2, and L∞ is the best treatment. Where, ʎ = 1/**Σ** parameters, L1 = degree of density * ʎ, L2 = (1- degree of density) * ʎ, L∞ = (1- degree of density)^2 * ʎ^2.

RESULTS AND DISCUSSION

Physical and chemical characteristics

Overrun

The interaction between *pandan wangi* juice concentration and sweetener type significantly affected the overrun value of cucumber sherbet ($p < 0.05$). The treatment of *pandan wangi* juice at 10% with honey sweetener has the highest overrun value compared to other treatments (Table 1). The amount of water affects the overrun value of cucumber sherbet.

Overrun is related to the amount of air in ice cream (Singo and Beswa, 2019), and this parameter can also be applied to sherbet products. Overrun is an important parameter because it can determine the quality of the sherbet. The presence of air in the sherbet can cause the texture of the sherbet to be light (Singo and Beswa, 2019). However, the more air voids in the sherbet, the easier it is for the sherbet to melt (Khairina et al., 2018). The high or low overrun value is determined by the amount of air trapped in the product during freezing (Lestari et al., 2019). The more air trapped, the greater the volume of the product after the freezing process. In addition, the composition of sherbet can affect product overruns (Khairina et al., 2018). Table 1 shows that the treatment of *pandan wangi* juice concentration of 10% with honey as a sweetener type and concentration of 15% with fructose as a sweetener type has the highest overrun value. These 2 treatments were significantly different from the other treatments. According to Khairina et al. (2018), adding liquid will reduce the amount of solids in the dough, resulting in a higher overrun value.

Table 1. Average overrun value of cucumber sherbet

Treatment	Overrun (%)
PWJ 5% + ST simple syrup	4.50±1.10^b
PWJ 5% + ST fructose	6.87±0.74^b
PWJ 5% + ST honey	7.56±0.77^b
PWJ 10% + ST simple syrup	6.74±1.22^b
PWJ 10% + ST fructose	6.97±0.91^b
PWJ 10% + ST honey	13.37±0.90^a
PWJ 15% + ST simple syrup	4.45±1.06^b
PWJ 15% + ST fructose	12.02±2.16^a
PWJ 15% + ST honey	6.78±0.59^b

Note: PWJ = *Pandan wangi* juice concentration; ST = Sweetener type. Different notations in the same column indicate a significant difference at α = 0.05

The overrun value of cucumber sherbet is between 4.45 to 13.37% (Table 1). This value is lower than the overrun value of orange sherbet (13.68 to 27.33%) (Aishwariya et al., 2019) and sherbet with orange peel pectin (20.40 to 24.20%) (Aulia et al., 2017). This condition could be due to the difference in sherbet formulation. The formulations in orange sherbet and sherbet with orange peel pectin contain a lot of milk. Milk contains protein, which can affect the sherbet's overrun value. This condition is due to the protein's ability to trap air during stirring. The higher the protein content, the higher the ability to trap air, so the overrun value is also higher (Choirunnisa et al., 2022). It differs from the cucumber sherbet formulation, which has a low milk content, so the overrun value is also low.

Texture

The interaction between the factors of *pandan wangi* juice concentration and the type of sweetener did not significantly affect the texture of the sherbet (Table 2), as well as the kind of sweetener that did not significantly affect the texture. On the other hand, the concentration of *pandan wangi* juice factor significantly influenced the texture value (Table 3). The 15% concentration of *pandan wangi* juice has the highest texture value (Table 2). It is because the *pandan wangi* juice is made from *pandan wangi* leaves mixed with water in a ratio of 1:10 (w/v). The higher the amount of water in the sherbet formulation, the more it can cause large ice crystal formation, giving the sherbet a more complex texture. The lower amount of water in

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Table 2. Average texture value of cucumber sherbet

Treatment	Overrun (%)
PWJ 5% + ST simple syrup	49.93±0.08[a]
PWJ 5% + ST fructose	49.94±0.14[a]
PWJ 5% + ST honey	48.72±2.30[a]
PWJ 10% + ST simple syrup	49.95±0.14[a]
PWJ 10% + ST fructose	47.12±4.60[a]
PWJ 10% + ST honey	44.99±2.87[a]
PWJ 15% + ST simple syrup	49.97±0.15[a]
PWJ 15% + ST fructose	49.91±0.07[a]
PWJ 15% + ST honey	50.08±0.01[a]

Note: PWJ = *Pandan wangi* juice concentration; ST = Sweetener type

the sherbet formulation can make the texture of the sherbet softer and more enjoyable to consume.

Sherbet that has a lower texture value means it has a softer texture. In Table 3, the value of sherbet texture is 47.35 to 49.98 N. This texture value aligns with Lewerissa et al. (2022), who researched tempeh sherbet. In her research, the texture value of tempeh sherbet is 4866.0024 gf (gram force), equivalent to 47.72 N.

Color profile

Color analysis with a color reader using the L, a, b color system (Novita et al., 2022). The average L, a- and b+ values of cucumber sherbet can be seen in Table 4. In contrast, further tests of a- and b+ values of cucumber sherbet can be seen in Table 5. The interaction between the *pandan wangi* juice concentration and the type of sweetener factor did not significantly affect cucumber sherbet's L, a-, and b+ values. On the L parameter, each factor also did not significantly affect the L of the sherbet ($p < 0.05$).

Table 3. Further test of texture value of cucumber sherbet

Pandan wangi juice concentration (%)	Mean texture value (N)
5	49.53±1.30[ab]
10	47.35±3.46[b]
15	49.98±0.11[a]

Note: Different notations in the same column indicate a significant difference at $\alpha = 0.05$

On the a- parameter, the *pandan wangi* juice concentration factor significantly affects the a- value of sherbet (Table 5). The 15% *pandan wangi* juice concentration has the highest a- value. This is due to pandan leaves containing chlorophyll pigments (Sowndhararajan et al., 2016). Chlorophyll pigments contained in pandan leaves produce a green color. The higher the concentration of *pandan wangi* juice added, the higher the a- value.

On the b+ parameter, the *pandan wangi* juice concentration and sweetener type factors each significantly influenced the b+ value of sherbet (Table 4). Besides chlorophyll, *pandan wangi* also contains carotene (Ningrum et al., 2015). This is why the higher the concentration of *pandan wangi* juice, the higher the b value. Fructose is colorless (Montañez-soto et al., 2013), while simple syrup is yellowish-white, and honey is brownish-yellow (Wahdini et al., 2022). The appearance of cucumber sherbet can be seen in Figure 1.

Melting time and TDS

The interaction between *pandan wangi* juice concentration and sweetener type did not significantly affect cucumber sherbet's melting time and TDS (Table 6). *Pandan wangi* juice concentration factor had no significant effect on

Table 4. Average L, a-, and b+ value of cucumber sherbet

Treatment	L	a-	b+
PWJ 5% + ST simple syrup	48.78±2.27[a]	-3.48±1.49[a]	9.88±2.01[a]
PWJ 5% + ST fructose	46.71±3.98[a]	-3.24±0.89[a]	8.16±1.98[a]
PWJ 5% + ST honey	45.26±3.04[a]	-3.29±1.23[a]	10.14±0.05[a]
PWJ 10% + ST simple syrup	46.71±3.97[a]	-4.84±1.65[a]	12.63±1.55[a]
PWJ 10% + ST fructose	42.98±1.93[a]	-4.16±0.99[a]	10.78±1.34[a]
PWJ 10% + ST honey	44.44±3.26[a]	-3.62±0.64[a]	9.71±1.94[a]
PWJ 15% + ST simple syrup	43.29±4.88[a]	-6.04±2.32[a]	14.31±1.46[a]
PWJ 15% + ST fructose	43.91±4.06[a]	-4.19±0.55[a]	11.04±1.44[a]
PWJ 15% + ST honey	44.06±2.26[a]	-4.76±0.56[a]	13.85±1.98[a]

Note: PWJ = *Pandan wangi* juice concentration; ST = Sweetener type; L = Lightness; a- = Greenness; b+ = Yellowness

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Table 5. Further test of a- and b+ values of cucumber sherbet

Pandan wangi juice concentration (%)	Mean a- value	Mean b+ value
5	-3.34±1.07[a]	9.39±1.69[c]
10	-4.21±1.14[ab]	11.04±1.90[b]
15	-4.99±1.47[b]	13.07±2.10[a]
Sweetener type		Mean b+ value
Simple syrup		12.28±2.29[a]
Fructose		9.99±1.85[b]
Honey		11.24±2.27[ab]

Note: a- = Greenness; b+ = Yellowness. Different notations in the same column indicate a significant difference at $\alpha = 0.05$

Table 6. Average melting time and TDS value of cucumber sherbet

Treatment	Melting time (minutes)	TDS (°Brix)
PWJ 5% + ST simple syrup	43.10±4.44[a]	16.33±0.58[a]
PWJ 5% + ST fructose	30.12±2.45[a]	19.67±0.58[a]
PWJ 5% + ST honey	34.07±0.76[a]	21.17±1.61[a]
PWJ 10% + ST simple syrup	41.13±1.71[a]	15.67±0.58[a]
PWJ 10% + ST fructose	26.92±0.85[a]	19.87±0.12[a]
PWJ 10% + ST honey	32.17±1.67[a]	20.33±1.15[a]
PWJ 15% + ST simple syrup	42.46±4.79[a]	13.67±1.53[a]
PWJ 15% + ST fructose	25.82±0.41[a]	19.93±0.12[a]
PWJ 15% + ST honey	28.43±3.83[a]	20.67±0.76[a]

Note: PWJ = *Pandan wangi* juice concentration; ST = Sweetener type; TDS = Total dissolved solid

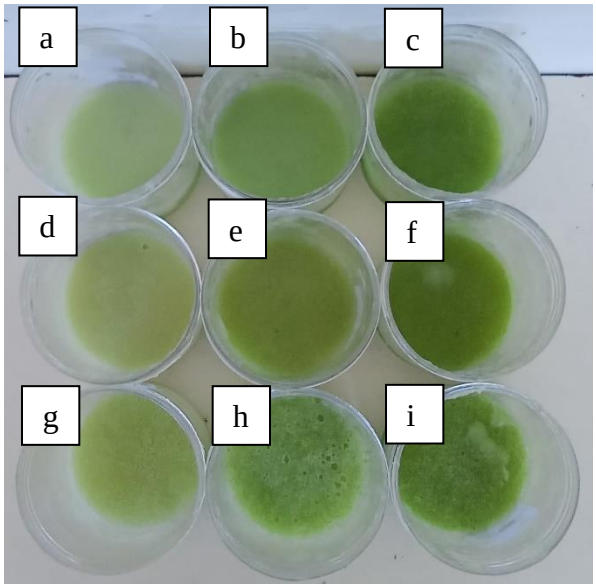

Figure 1. Cucumber sherbet: a) PWJ 5% + ST fructose; b) PWJ 10% + ST fructose; c) PWJ 15% + ST fructose; d) PWJ 5% + ST honey; e) PWJ 10% + ST honey; f) PWJ 15% + ST honey; g) PWJ 5% + ST simple syrup; h) PWJ 10% + ST simple syrup; i) PWJ 10% + ST simple syrup

Note: PWJ = *Pandan wangi* juice concentration; ST = Sweetener type

both parameters. At the same time, the sweetener type factor significantly affected both parameters. Further tests on melting time and TDS can be seen in Table 7.

Melting time is affected by overrun. The higher the overrun value, the faster the melting time (Khairina et al., 2018). In the research conducted by Khairina et al. (2018), an increase

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Table 7. Further test of melting time and TDS

Sweetener type	Mean melting time (Minutes)	Mean TDS (°Brix)
Simple syrup	42.23±3.49[a]	15.22±1.48[b]
Fructose	31.55±3.27[b]	19.82±0.32[a]
Honey	27.62±2.34[c]	20.72±1.12[a]

Note: TDS = Total dissolved solid. Different notations in the same column indicate a significant difference at $\alpha = 0.05$

in air can cause ice cream products to melt easily. This is due to the presence of air in the ice cream product, causing the formation of air cavities that will be released along with the melting of ice cream products. Table 1 shows the highest overrun value in the treatment of *pandan wangi* juice concentration 10% with honey as sweetener type (13.37%). Table 7 shows that honey has the lowest melting time value (27.62 minutes). This aligns with research conducted by Khairina et al. (2018). The sweetener type factor significantly influenced the TDS of cucumber sherbet. Simple syrup sweetener type has the lowest TDS value. This is because simple syrup is made from sugar mixed with water in a ratio of 1:1 (w/v). Fructose and honey were added to the sherbet formulations are not diluted with water like simple syrup, so the sherbet formulation using simple syrup has a low TDS value.

Vitamin C content

Cucumber is an agricultural commodity that is one of the sources of vitamin C (Uthpala et al., 2020). So, the vitamin C content of the sherbet needs to be measured. The interaction between the concentration of *pandan wangi* juice and the type of sweetener factor did not significantly affect the vitamin C content of cucumber sherbet (Table 8). The concentration factor of *pandan wangi* juice and the kind of sweetener each also did not significantly affect the vitamin C content of cucumber sherbet. This is because the constituent component of sherbet containing vitamin C is cucumber. The amount of cucumber added to each treatment was similar. Vitamin C in cucumber is 3.2 mg 100 g^{-1} (Uthpala et al.. 2020).

Table 8. Mean value of vitamin C content of cucumber sherbet

Treatment	Vitamin C content (%)
PWJ 5% + ST simple syrup	0.027±0.001[a]
PWJ 5% + ST fructose	0.032±0.005[a]
PWJ 5% + ST honey	0.035±0.009[a]
PWJ 10% + ST simple syrup	0.044±0.015[a]
PWJ 10% + ST fructose	0.026±0.017[a]
PWJ 10% + ST honey	0.032±0.005[a]
PWJ 15% + ST simple syrup	0.041±0.005[a]
PWJ 15% + ST fructose	0.050±0.031[a]
PWJ 15% + ST honey	0.029±0.005[a]

Note: PWJ = *Pandan wangi* juice concentration; ST = Sweetener type

Total chlorophyll

The interaction between the concentration of *pandan wangi* juice and the type of sweetener factor did not significantly affect the total chlorophyll content of cucumber sherbet (Table 9). The *pandan wangi* juice concentration factor significantly affects the total chlorophyll content of cucumber sherbet (Table 10). This is because pandan leaves contain chlorophyll pigments (Sowndhararajan et al., 2016). So, a greater concentration of *pandan wangi* juice was added, the higher the total chlorophyll content of sherbet. Chlorophyll pigments can also act as antioxidants (Pérez-gálvez et al., 2020).

Table 9. Mean total chlorophyll content of cucumber sherbet

Treatment	Total chlorophyll (mg l^{-1})
PWJ 5% + ST simple syrup	0.80±0.17[a]
PWJ 5% + ST fructose	0.80±0.79[a]
PWJ 5% + ST honey	0.71±0.47[a]
PWJ 10% + ST simple syrup	1.27±0.22[a]
PWJ 10% + ST fructose	1.51±0.93[a]
PWJ 10% + ST honey	1.03±0.63[a]
PWJ 15% + ST simple syrup	1.64±0.28[a]
PWJ 15% + ST fructose	1.51±0.56[a]
PWJ 15% + ST honey	1.96±0.77[a]

Note: PWJ = *Pandan wangi* juice concentration; ST = Sweetener type

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Table 10. Further test of chlorophyll total value of cucumber sherbet

Pandan wangi juice concentration (%)	Mean chlorophyll total (mg l^{-1})
5	0.77 ± 0.47^{b}
10	1.27 ± 0.61^{ab}
15	1.70 ± 0.53^{a}

Note: Different notations in the same column indicate a significant difference at $\alpha = 0.05$

The best treatment

Based on the calculation results, the best treatment is *pandan wangi* juice with a concentration of 15% with fructose syrup as a sweetener type. This treatment has the following characteristics: overrun 12.02%, texture value 49.91 N, L value 43.91, a- value -4.19, b+ value 14.31, melting time 25.82 minutes, TDS 19.93 °Brix, vitamin C content 0.05%, and chlorophyll content 1.51 mg l^{-1}.

CONCLUSIONS

The interaction between *pandan wangi* juice concentration and sweetener type significantly influenced the overrun of cucumber sherbet. The concentration factor of *pandan wangi* significantly influenced the texture, a- value, b+ value and total chlorophyll. The type of sweetener significantly affects the b+ value, melting time, and TDS. The best treatment is *pandan wangi* juice concentration of 15% with fructose syrup as a sweetener type.

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