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ANTIOXIDANT ACTIVITY, PHYSICAL QUALITY, AND SENSORY PROPERTIES OF WATERMELON (*Citrullus lanatus*) ALBEDO ICE CREAM WITH HONEY

Aktivitas Antioksidan, Sifat Fisik, Dan Karakter Sensori Es Krim Albedo Semangka (*Citrullus lanatus*) Dengan Penambahan Madu

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ABSTRACT

Antioxidants are nutritional and non-nutritional substances contained in food, which can prevent or slow down oxidative damage in the body. Antioxidant compounds can be obtained by eating healthy foods, fruits, and vegetables. The albedo of watermelon and honey which contain antioxidants has the opportunity to be developed into products such as ice cream. This study aimed to determine the antioxidant activity, physical quality, and sensory quality of watermelon albedo ice cream with the addition of honey. This research was conducted experimentally using the completely randomized design (CRD) method with four treatment levels. The ratio of watermelon albedo and honey were 30%:0% (F0), 30%:10% (F1), 20%:20% (F2), and 10%:30% (F3). The observed parameters were antioxidant activity, physical quality (melting rate and total solids), and sensory quality (color, aroma, taste, and texture). The results show that there was no difference in antioxidant activity in the F0, F1, F2, and F3 treatments. Meanwhile, the physical quality analysis shows differences in the melting speed and total solids of ice cream. Evaluation of sensory quality shows that panelists preferred ice cream without the addition of watermelon albedo and honey. All ice cream samples had 'normal' characteristics according to SNI 01-3713-1995 standard without the addition of artificial coloring and artificial sweeteners. The ice cream product of watermelon albedo with the addition of honey met the SNI minimum requirements for the quality of ice cream with a result of 20-31 in ºBrix unit.

***Keywords**: Ice cream, Watermelon Albedo, Honey, Antioxidant Activity, Sensory Properties*

ABSTRAK

Antioksidan merupakan substansi nutrisi maupun non nutrisi yang terkandung dalam pangan, yang mampu mencegah atau memperlambat terjadinya kerusakan oksidatif dalam tubuh. Senyawa-senyawa antioksidan dapat diperoleh dengan mengonsumsi makanan sehat, buah-buahan, dan sayuran. Albedo kulit semangka dan madu yang memiliki kandungan antioksidan berpeluang untuk dikembangkan menjadi produk seperti es krim. Penelitiaan ini bertujuan untuk mengetahui aktivitas antioksidan, mutu fisik, dan kualitas sensori es krim albedo kulit semangka dengan penambahan madu. Penelitian ini dilakukan secara eksperimental dengan desain penelitian Rancangan Acak Lengkap (RAL), dengan empat taraf perlakuan. Rasio albedo kulit semangka dengan madu yakni F0 30%:0%, F1 30%:10%, F2 20%:20%, dan F3 10%:30%. Analisis yang dilakukan meliputi aktivitas antioksidan, mutu fisik (kecepatan leleh dan total padatan), dan kualitas sensori (warna, aroma, rasa dan tekstur). Hasil penelitian diketahui bahwa tidak terdapat perbedaan aktivitas antioksidan pada perlakuan F0, F1, F2, dan F3. Hasil analisis mutu fisik menghasilkan perbedaan pada kecepatan leleh dan total padatan es krim. Evaluasi terhadap kualitas sensori memberikan hasil bahwa panelis lebih menyukai es krim tanpa penambahan albedo kulit semangka dan madu. Semua sampel es krim memiliki karakteristik 'normal' sesuai SNI 01-3713-1995 dengan tanpa penambahan pewarna

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buatan dan pemanis buatan. Produk es krim albedo kulit semangka dengan penambahan madu telah memenuhi syarat minimum mutu es krim SNI dengan hasil nilai 20-31 dalam satuan ºBrix.

Kata kunci: Es Krim, Albedo Semangka, Madu, Aktivitas Antioksidan, Kualitas Sensori

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INTRODUCTION

Cigarette smoke pollution, car smoke, consumption of oily food, sun exposure, and certain drugs are the sources of free radical compound formation that are difficult to avoid (Putri *et al*., 2020). Free radicals are molecules that carry one or more unpaired molecules so short-lived, highly reactive, and unstable (Suryadinata, 2018). Free radicals trigger oxidative stress, a phenomenon where an imbalance between free radicals and antioxidants happens (Berawi and Agverianti, 2017). Oxidative stress has a role in various degenerative diseases such as cancer, diabetes mellitus, atherosclerosis, which is the cause of coronary heart disease or heart failure that belong to non-communicable diseases. The high prevalence of non-communicable diseases in Indonesia is due to unhealthy lifestyle. Based on the results of Basic Health Research in 2018, 33.5% people lack of physical activity, 29.3% people from productive age smoke every day, 31% have suffering from central obesity, and 21.8% are obese in adults (Kemenkes RI, 2018).

The above condition causes the body need an intake containing antioxidant compounds to capture and neutralize free radicals to stop follow-up reactions that cause oxidative stress. Cell damage can be avoided, or the induction of a disease can be controlled (Perwata, 2017). According to Permatasari (2020), antioxidants are nutritional and non-nutritional substances contained in food, which can prevent or slow oxidative damage in the body. Antioxidant can be obtained by consuming healthy foods, fruits, and vegetables.

Watermelon as one of antioxidant source is generally consumed only for the flesh part, while the skin (albedo) is discarded. Watermelon albedo contains water and potassium, which can lower systolic and diastolic blood pressure due to vascular resistance caused by enlarged blood vessels and an increased loss of water and sodium in the body (Tulungnen *et* al., 2016). Antioxidant such as beta-carotene and vitamin C are also found in watermelon albedo, as well as phenols that help maintain healthy somatic cells (Putri *et al*., 2020). According to Patil (2020), the watermelon skin (albedo) and the fruit flesh are having a non-essential citrulline substance (Setiawan and Widyastuti, 2016). Citrulline in the albedo is approximately 60% higher than in flesh, which is beneficial for heart and immunity (Mawaddah, 2011).

Honey as essential food plays an important role in boosting the immune system because of the high antioxidants components within. Alvarez-suarez *et al*., (2010), stated that at least 181 substances contained in honey including sugars, small amounts of proteins, enzymes, amino acids, minerals, trace elements, vitamins, aroma compounds and polyphenols. Among the compounds found in honey; vitamin C, phenols, catalase, peroxides, glucose oxidase enzymes have antioxidant properties. Honey also contains flavonoids and carotenoids. High levels of these indicators ensure a high level of antioxidants in honey. Antioxidant properties of honey act as an antidepressant during high emotional, physical and intellectual stress (Jaganathan & Mandal, 2009).

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The demand for healthy food is increasing due to public awareness about the positive health effects of consuming healthy food. Ice cream is one of the favorite products for various age because of delicacy and texture. The ice cream market in Indonesia was growing at annual growth rate of 7.8% during 2014–2019 (Canadean, 2015). The consumption of ice cream products has reached 158 million kg in 2018 and forecasted to grow by 16% per year until 2020 with the market value reached Rp19.8 trillion (Ciptadana Sekuritas Asia, 2018). In addition, certain ice cream also contains many nutrients such as vitamins, minerals, proteins, carbohydrates, and fats that made ice cream being functional product. This paper investigated the antioxidant activity, physical quality, and organoleptic quality of ice cream incorporated with watermelon albedo and honey.

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METHODS

Biomaterials and Chemicals

The ingredients used to make ice cream included UHT milk (Ultra milk), liquid skim milk (Greenfields), whipped cream (Haan), egg yolk, water, sugar, Carboxy Methylcellulose (CMC), watermelon albedo that all obtained from Mantingan market, East Java, Indonesia. The longan honey was obtained from Sidoarjo, East Java, Indonesia. The chemicals used for antioxidant analysis were aluminium foil, DPPH (1,1-diphenyl-2-picrylhydrazyl) (Sigma Aldrich), ascorbic acid (Emsure), methanol pro analysis (PA) (Merck).

Preparation of Ice Cream

Ingredients such as UHT milk, skim milk, eggs, sugar, and CMC were mixed for 60 minutes by using homogenizer (Philips HR 2115). The ice cream mix was pasteurized for 15 minutes. The mixture then filtered and added with watermelon albedo and honey according formulations treatment (Table 1). The albedo was prepared by scraping off the outermost green skin of the watermelon. The light green layer was the albedo that diced onto smaller size prior to pulverizing. The ice cream mixture was put in a refrigerator for 24 hours at 4°C. After agitation, the ice cream mix was placed in the ice cream maker (Hicom ICM-15A) for 30 minutes, allowing the mixture to become ice cream. Finally, ice cream was kept in a freezer for 24 hours at -18°C previous to sensory and quality analysis.

Table 1. Ice cream formulation

Materials (g)	Material weight			
	F0	F1	F2	F3
UHT milk	1000	600	600	600
Skim milk	200	120	120	120
Whipped cream	200	120	120	120
Egg	220	132	132	132
Sugar	100	60	60	60
CMC	9	7	7	7
Watermelon albedo	0	518.7	345.8	172.9
Honey	0	172.9	345.8	518.7
Total (g)	1729	1729	1729	1729

Determination of Antioxidant Activity

Antioxidant activity was examined according to Tristantini *et al.*, (2016). The stock solution was made by weighing 10 mg of ice cream and dissolving into 100 mL methanol PA. A series of dilution was made for the concentration of 5, 6, 7, 8, and 9 ppm for each treatment. The DPPH stock solution was made by dissolving 5 mg of DPPH into 100 mL methanol. The blank solution was consisted of 2 mL methanol added with 1 mL of 50 ppm DPPH. For each treatment, 2 mL of sample transferred into reaction tube covered with aluminium foil, then added

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with 1 mL of 50 ppm DPPH solution. Incubation was done for 30 mins at 27ºC. All samples were then measured for the absorbance value by using Spectrophotometer UV-Vis at 517 nm (Digilife UV-752N). Antioxidant activity was presented as inhibition value with formula as follow:

$$\%\ inhibition = \left(1 - \frac{Sample\ absorbance}{Blanko\ absorbance}\right) x\ 100\%$$

A curve was made between the sample concentration in ppm (x) and the % inhibition (y). A linear regression equation was made using the formula:

y = bx + a.

y = % inhibition

x = sample concentration in ppm units

Inhibitory concentration (IC_{50}) was calculated by the value of y set with 50%, so the x value (concentration of sample) was obtained. The lower the IC_{50} value indicated higher free radical inhibition activity. Antioxidant activity is divided into categories. Antioxidants are classified as very strong when IC_{50} values is <50 ppm, strong 50-100 ppm, medium 100-150 ppm, weak 150-200 ppm, and IC_{50} value over 200 ppm is very weak (Purwanto *et al*., 2017).

Determination of Physical Quality

The melting speed was measured by the method of Al Hajar and Rahayu, (2019). Ice cream sample was taken uniformly and placed in a petri dish. Sample allowed to stand at room temperature and left until the entire sample melts (the ice cream melts following the shape of the container). The time it took for the whole sample to melt was recorded and subsequently analyzed.

Measurement of total dissolved solids was using a refractometer (Atago ATC-2E) at room temperature and was calibrated using aquadest. As much as 1-2 g of the sample was inserted into the refractometer prism, then the amount of dissolved solid content was expressed as °Brix.

Determination of Sensory Properties

Sensory evaluation was done by using hedonic test for the parameters of color, aroma, taste, and texture. The panelist assessed the sample by being randomly coded with the scoring scale 1: like extremely, 2: like, 3: neither like nor dislike, 4: dislike, 5: dislike extremely (Al Hajar and Rahayu, 2019).

Ethical Clearance

This study had an ethical clearance No. 408/KEPK/EC/2021 that has been approved by the Health Research Ethics Commission (HREC) of Universitas Negeri Semarang.

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Data Analysis

All samples were run in triplicates. The data were expressed as mean ± standard of deviation. Data was analyzed for variation using one-way analysis of variance (ANOVA) and the means separated by Duncan's multiple-range test. Significance between related samples was analyzed at the level of 0.05 ($p < 0.05$).

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RESULTS AND DISCUSSION

Antioxidant Activity

There was no difference in all samples for the antioxidant activity (Table 2). F0 treatment with a concentration of 100% milk had a strong antioxidant activity. Milk contains major antioxidant components, such as protein that is rich in sulfur amino acids, vitamin A, E, C, and beta-carotene (Stobiecka and Brodziak, 2022). Beta-carotene and vitamin C are included in secondary antioxidants. Secondary antioxidants are antioxidants that are not produced naturally by the human body and are obtained through dietary sources of antioxidants (Chauliyah and Murbawani, 2015). The antioxidant activity of the control treatment in this study was much higher than previous studies by Khairina *et al.* (2018) that found an increase in the antioxidant activity along with the addition of apple cider into the ice cream. Also, in line with increasing antioxidant activity in ice cream after addition of lontar palm (*Borassus flabeliffer* L.) by Idayati *et* al. 2019, and lemongrass juice with the different types of milk (Triastini, 2018). The result of IC_{50} calculation from all ice cream samples is shown in Table 2.

Table 2. Antioxidant activity of ice cream samples

Treatments	Concentration series (ppm)	Abs	Abs of Blanko	% Inhibition	Equation(y=bx+a)	IC_{50}	Note
F0	4	0.821	0.875	6.17	y = 3.6914x – 2.7543 r^2 = 0.9966	49.25	Very strong
	8	0.786		10.17			
	12	0.749		14.40			
	16	0.723		17.37			
	20	0.691		21.02			
F1	4	0.684	0.875	21.82	y = 11.52x – 10.514 r^2 = 0.9985	49.08	Very strong
	8	0.586		33.02			
	12	0.470		46.28			
	16	0.380		56.57			
	20	0.283		67.65			
F2	4	0.641	0.875	26.74	y = 10.8x – 15.669 r^2 = 0.9796	48.54	Very strong
	8	0.568		35.08			
	12	0.421		51.88			
	16	0.379		56.68			
	20	0.263		69.94			
F3	4	0.751	0.875	14.27	y = 12.274x – 1.8057 r^2 = 0.9745	49.85	Very strong
	8	0.616		29.60			
	12	0.571		34.74			
	16	0.450		48.57			
	20	0.297		66.05			

F0: ice cream formula without the addition of watermelon albedo and honey (control)
F1: ice cream formulation with the addition of watermelon albedo 30% and honey 10%
F2: ice cream formulation with the addition of watermelon albedo 20% and honey 20%
F3: ice cream formulation with the addition of watermelon albedo 10% and honey 30%

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All ice cream samples had showed IC_{50} under fifty ppm, which means antioxidant activity was very strong. It showed that ice cream formulated with watermelon albedo and honey in this paper showing a high antioxidant activity. Watermelon albedo is rich in vitamins A, B, and C and carotenoids such as lycopene and beta-carotene (Lubis, 2019). In contrast, honey has enzymatic and non-enzymatic antioxidant. Enzymatic antioxidant in honey is catalase, glucose oxidase, and peroxidase, while non-enzymatic antioxidants are ascorbic acid, flavonoids, amino acids, and proteins (Pontis *et al.*, 2014).

Vitamin C (L-ascorbate) consists of hydroxyl and carbonyl groups that make this molecule an electron donor, act as a cofactor of various enzymatic reactors, and act as a local antioxidant in plasma. When oxidized, ascorbate becomes Ascorbate Free Radical (AFR). The accumulation of AFR triggers a reaction between two AFR molecules that make up one ascorbic molecule and one molecule of dehydroascorbate (DHA). L-ascorbate becomes an antioxidant because DHA reacts with free radicals and inhibits its reaction within a cellular environment with high concentrations of L-ascorbate on the cell walls of blood vessels. L-ascorbate induces purifying of endothelial cells and decreases apoptosis induced by oxidative stress and oxidative LDL (Farbstein *et al.*, 2010).

In addition to vitamin C, beta-carotene also acts as an antioxidant in watermelon albedo ice cream with honey. Beta-carotene is one of the carotenoids, like an orange pigment, and is a precursor to vitamin A in plants. Beta-carotene's interaction with other antioxidants can increase its capacity of capturing free radicals (Chauliyah and Murbawani, 2015). Flavonoids in honey also play a role in increasing antioxidant activity in watermelon albedo ice cream with honey. Flavonoids are exogenous antioxidants that contain phenolic groups and have been shown to prevent cell damage due to oxidative stress. The mechanism of working of flavonoids as antioxidants directly or indirectly. Flavonoids are having antioxidant mechanism by donating hydrogen ions to stabilize reactive free radicals and act as scavengers/antidotes to free radicals (Cahyani, 2017).

Physical Properties

Melting Speed

Table 3 shows the result of melting speed observation. The melting speed is related with the time taken for ice cream to completely melt with a specific volume. The length of ice cream melt is related to the body or texture and intensity of sweetness. The body and texture of the ice cream are determined by the total solids contained in the dough. A weak body is indicated by ice cream that is less sturdy and always accompanied by rapid melting. The melting speed of ice cream is greatly influenced by the ingredients used in the manufacture of ICM (Ice Cream Mix). Good ice cream is more resistant to melting when served at room temperature (Violisa *et* al., 2012). The results of the ANOVA statistical test showed that there was a difference ($p<0.05$) to the melting speed of ice cream.

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Table 3. The Results of Physical Quality Analysis

Physical parameters	Treatments			
	F0	F1	F2	F3
Melting speed	72.2 ± 1.40b	63.0 ± 2.30b	50.0 ± 4.25ab	34.5a ± 1.30
Total solids	20 ± 1.89b	21 ± 1.27b	30 ± 1.57a	31 ± 1.11a

Values were expressed as means± std. deviation*; the same superscript letters in the same rows are not significantly different (p < 0.05) compared to control sample.*
F0: ice cream formula without the addition of watermelon albedo and honey (control)
F1: ice cream formulation with the addition of watermelon albedo 30% and honey 10%
F2: ice cream formulation with the addition of watermelon albedo 20% and honey 20%
F3: ice cream formulation with the addition of watermelon albedo 10% and honey 30%

Along with the inclining concentration of watermelon albedo and declining concentration of honey, ice cream melting speed increased. F0 treatment had a melting time of 72.2 minutes, F1 63.0 minutes, F2 50.0 minutes, while F3 treatment 34.58 minutes. Based on the data above, the melting speed of ice cream is influenced by the composition of the materials used, such as stabilizer and emulsifier concentrations, processing conditions, and storage conditions. Stabilizers used in ice cream serve to improve the stability of the emulsion, increasing smoothness (Violisa *et* al.,2012).

In this study, watermelon albedo ice cream with honey had surpassing the Indonesian National Standard (SNI). According to SNI No. 01-3713-1995, the range of good melting on ice cream is 15-20 minutes. Tiara *et al.,* 2017 stated that the higher the viscosity of ice cream, the denser and longer the melting. Another study stated that ice cream melt more slowly because air bubbles act as insulator in the product (Sofjan and Hartel, 2004). The quality of ice cream is also determined by the melting power of the ice cream. Ice cream is expected not to melt quickly at room temperature but fast melt at an assumed body temperature in the human oral cavity. The longer it takes for ice cream to thaw at room temperature, the more stable the product is (Sanggur, 2017).

Total Solids

In an ingredient, total dissolved solids, sweetness levels, or total sugars include reducing sugars, non-reducing sugars, organic acids, pectin, salt, and proteins could significantly affect °Brix (unit for total solid measurement). The results of the total solids analysis of watermelon albedo ice cream with honey are shown in Table 3. The higher honey concentration led to higher total solids of ice cream. According to Ahmed (2018), honey has a main sugar content such as fructose 38% and glucose 31% in 100 g. There was no significant difference between F0 and F1, but both of them had significant difference with F3 and F4.

The total solids play an essential role in forming ice cream bodies and slowering the melting speed of ice cream. Total solids are required for flavour formation, lowering the freezing point, and increasing the viscosity of liquids or ice cream dough. The more addition of solids in the ice cream dough, the less the amount of water frozen within (Violisa *et al.,* 2012). In this study, the ice cream products had a high total solids. This might be affected by

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honey addition that has a high total solids (Lastriyanto and Aulia, 2021), combined with total solids of the watermelon albedo, the ingredients (milk, sugar, and whipped cream) so it makes the total ice cream solids higher.

Indonesia National Standard for ice cream (SNI 01-3713-1995) determines the minimum total solid of ice cream is 3.4% (w/w). All ice cream samples had met the minimum quality requirements of SNI with results value ranged from 20 – 31 in ºBrix unit, meaning that the mass fraction of sugar/solid substances equivalent to 20 – 31% in total mass of solution.

Sensory Properties

There was a difference in color parameter among the four treatments samples. The most preferred sample ice cream by its color was the F0 treatment with average scoring value 3.12. Overall, the color of watermelon albedo ice cream with honey was influenced by the natural color of egg yolk as a developer ingredient that causes the ice cream to have a yellowish color. The natural color of egg yolk comes from carotenoids (Sahara, 2010). Carotenoids are natural pigments that are predominantly yellow, orange, and red. Carotenoid stains consist mainly of lutein and zeaxanthin, which are included in xanthophyll terms that make the yolk pigment yellow to reddish-orange (Darmawan *et al.,* 2016), thus affecting the color of watermelon albedo ice cream with honey.

There was a significant difference of aroma in watermelon albedo ice cream with honey (Table 4.). The control sample (F0) significantly had different aroma from F1, F2, and F3. Addition of watermelon albedo brought a specific aroma into the ice cream. The aroma of F0 treatment (control) was the most preferred. F1, F2, and F3 with each concentration of watermelon albedo and honey had cucumber-like aromas. This due to the volatile compounds found in the watermelon albedo (rind). Du *et al*., 2022, identified the volatile components which contained in watermelon rind juices including butanal (0.09–1.19%), pentanal (0.20–1.57%), decanal (0.02–0.07%), benzaldehyde (0.05–0.52%), (Z)-2-penten-1-ol (0.22–0.39%), tetrahydrolinalool (0.01–0.07%), isobornyl acetate (0.01–0.10%), methyl (Z,Z)-9,12-octadecadienoate (0.02%), and dimethyl trisulfide (0.01–0.17%). Also, watermelon albedo had significantly higher (1.5×) and dominant amounts of citrulline and arginine (61.4 and 53.8 mg/100 g, respectively) than flesh.

Table 4. Sensory Evaluation Results

Parameters	Hedonic Test Results			
	F0	F1	F2	F3
Color	1.84 ± 0.19b	2.76 ± 0.29a	2.92 ± 0.13a	3.12 ± 0.16a
Aroma	2.12 ± 0.41b	3.44 ± 0.43a	3.56 ± 0.13a	3.32 ± 0.21a
Taste	1.64 ± 0.20b	3.24 ± 0.17a	3.68 ± 33a	3.68 ± 0.22a
Texture	2.60 ± 0.26a	3.44 ± 0.29a	2.76 ± 0.13a	3.40 ± 0.34a

Values were expressed as means± std. deviation*; the same superscript letters in the same rows are not significantly different (p < 0.05) compared to control sample.*
Rating scale: 1= like extremely; 2= like; 3= neither like or dislike; 4= dislike; 5= dislike extremely

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There was a significant difference in the taste of watermelon albedo ice cream with honey (Table 4). The impression of sweet taste arises due to the main ingredient (milk) and the addition of sugar. The addition of thickening agents can reduce the sweetness of sugar and changes in texture that can change the taste of ice cream (Moulina, 2018). However, the addition of watermelon albedo and honey as a thickening agent (viscosity) ice cream, milk, and sugar could maintain the flavor. The exact amount of 60 g sugars into F1, F2, and F3 had given a relatively uniform sweetness, meanwhile F0 as control treatment had given 100 g sugars. F0 had the highest rank of taste score.

Texture can be felt using the our sensing body part that are tongue and skin to feel a food texture (Haryanti and Zueni, 2015). Texture is a primary attribute that, together with visual appearance, taste, and aroma, comprises the sensory quality of foods. Ice cream is having high-quality when it feels high-fat or feels “rich”, sweet, smooth body, with a fully creamy texture (Hartatie, 2011). There was no significant difference for texture parameter among all samples. Addition of watermelon albedo and honey did not affect panelist preference. Ice cream is a dairy aerated dessert that is frozen prior to consumption. It is a microcrystalline network of liquid and solid phases, with air cells entrapped in liquid phase and various other components like proteins, fat globules, stabilizers, and sugar (Syed *et al*., 2018).Textural attributes being a key factor determining the market success of the product.

The higher concentration of watermelon albedo gave a slightly rough texture to ice cream. Generally, ice cream is having flaky or snowy texture, causing reduction in panelists’ preference. While the addition of honey to ice cream helps reduce the crystallization of ice cream so that the ice cream has a soft to the very soft texture (smooth) that makes ice cream preferred by the panelist. Haryanti and Zueni (2015) stated that the good texture of ice cream is smooth, creamy, easily to scoop and melt within mouth right away. If the ice cream is hard to scoop because of noticeable ice crystals, the ice cream quality is not that great. The low quality ice cream also has greasy texture, tastes like flour (grainy), as well as the presence of ice flakes (flaky or snowy) and sandy.

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CONCLUSION

All watermelon albedo ice cream with honey samples showed IC_{50} value <50 ppm, meaning they had very strong antioxidant activity. The best formulation based on physical quality test was the F3 treatment. The best formulation based on sensory properties was the F0 treatment. The physical quality analysis of watermelon albedo with honey resulted in a difference in the melting speed and total solids. The results of the sensory analysis showed differences in the color, aroma, and taste of ice cream. The total solid of ice cream had met the minimum quality requirements of SNI with results value ranged from 20 – 31 in ºBrix unit.

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