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Physicochemical Characteristics of Jelly Candy Cinnamon Powder Koerintji Variation of Red Seaweed Carrageenan Concentration

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Abstract

Jelly candy is a product that has the characteristics of being chewy and varied in texture. Carrageenan, an alternative natural raw material as a gelling agent in jelly candy, is one of the producers of red seaweed carrageenan because it has a very complex composition. Cinnamon contains about 91.88-94.19% cinnamaldehyde as an antioxidant compound. The study aimed to determine the value of the antioxidant activity obtained and the correlation between the cinnamon powder jelly candy Koerintji variety and the addition of red seaweed carrageenan with different concentration variations. The study was conducted using a completely randomized design with two factors. Carrageenan concentrations consist of 3.5% and 5%. The results showed that the concentration of red seaweed carrageenan significantly affected the antioxidant activity value and characteristics of cinnamon jelly candy. The best treatment was obtained at a concentration of 1.5% cinnamon and 5% red seaweed carrageenan with chemical characteristics water content 11.49%, antioxidant activity 50.26%, pH value 4.82%, physical characteristics colour (brightness) 40.72%, texture hardness 2.3%, adhesiveness 3.1%, elasticity 2.76%, colour preference 4.66%, aroma preference, 4.32%, flavour preference 4.66%, elasticity texture preference 4.56%, taste 4.80%, and overall 4.04%.

Keywords: physicochemical characteristics; carrageenan; cinnamon; soft candy; red seaweed.

INTRODUCTION

Candy food products often found and circulating on the market are very diverse, including chewy candy (jelly), hard candy, chocolate candy (bounty), caramel, nougat, and ginger. The National Standardization Agency/SNI (2008) states that jelly candy is a soft-textured candy processed by adding hydrocolloid ingredients such as agar, gum, pectin, starch, and carrageenan. One factor that can influence the process of making jelly candy is the presence of gel-forming ingredients. A gelling solid agent and a chewy texture can be created in jelly candy by adding ingredients that contain gelling agents. In general, jelly candy is made using gelatin as a gel-forming material, but the raw material for commercial gelatin is currently imported from abroad, such as Europe (Hidayah et al., 2013). One of the breakthroughs for replacing the gelling agent is red seaweed carrageenan. Red seaweed also contains antioxidants. Research conducted on the antioxidant compound content of several algae species using the free radical scavenging method by 1,1-Diphenyl-2-picrylhydidrazyl (DPPH) was carried out by (Lestario et al., 2008) with various solvents and obtained the highest value of red seaweed antioxidant activity, namely 43.43%, obtained from the acetone solvent extract. Compounds that are known to fight free radicals are antioxidants. Antioxidant compounds can be obtained from various food sources. Antioxidant compounds produced by plants, such as vitamin C, vitamin E, carotene, and phenolic groups, especially polyphenols and flavonoids, are known to have the potential to reduce the risk of degenerative diseases caused by free radicals. One of the foodstuffs that contain antioxidants that are obtained naturally is cinnamon. Cinnamon is a plant known to contain solid antioxidant active compounds (Andriyanto et al., 2014). Cinnamon is one foodstuff that contains antioxidants that can be obtained naturally. Cinnamon is a spice plant that has long been used as a fragrance or flavour enhancer in food or drinks. Cinnamon wood extract or powder has natural antioxidant activity because, in wood extract cinnamon powder, there are also chemical compounds such as cinnamaldehyde, eugenol, trans-cinnamic acid, phenolic compounds, and tannins. The antioxidant activity of cinnamon obtained was 45.42% (Sukandar, 2014). Cinnamon contains chemical compounds, including cinnamaldehyde, eugenol, trans-cinnamic acid, phenol compounds, and tannins. One type of cinnamon variety in Indonesia is the Koerintji variety cinnamon, which has the advantage of the Koerintji variety cinnamon itself, namely that it contains a very high cinnamaldehyde content of around 91.88 - 94.19%,

exceeding the SNI No. Standard. 06-3734-2006, namely 50%. From the various explanations above, it is necessary to develop finished products that contain antioxidants due to people's lifestyle changes, such as consuming foods that contain lots of fat and oil. This causes free radicals to form in the body.

MATERIALS AND METHODS

Material

The main ingredients used in this research were cinnamon of the Koerintji Variety obtained from Lempur Tengah Village, Gunung Raya District, Kerinci Regency, Jambi Province, and red seaweed (*Eucheuma cottoni* sp.) obtained from coastal seaweed farmers in Ritabel Village, District North Tanimbar, West Southeast Maluku Regency, sucrose (Rose Brand), fructose (Merck), citric acid (Merck). Meanwhile, the materials used for chemical analysis include 2,2-diphenyl-1-picrylhydrazyl (DPPH), methanol (Merck), KOH (Merck), and distilled water (Merck).

Procedures

The research was divided into three stages: making cinnamon powder, carrageenan, and jelly candy. Jelly candy was made using a factorial Completely Randomized Design (CRD) with two treatment factors: cinnamon powder concentrations of 0.5%, 1%, and 1.5% and red seaweed carrageenan concentrations of 3.5% and 5%. Each treatment was carried out with three repetitions.

Making cinnamon powder

The process of making cinnamon powder (Marfungah et al., 2019) with modifications: Cinnamon is cut into ± 1 cm pieces and dried in a cabinet dryer at 50°C for 8 hours. After drying, the cinnamon is then reduced in size by blending it until it becomes powder and then sifting it with a 60 mesh sieve until cinnamon powder is obtained.

Making carrageenan

The red seaweed is washed with running water until clean, then put into a basin and soaked in a KOH solution containing 1,840 mL (92%) and 160 g (32%) of distilled water. The function of KOH in cooling aims to reduce the content of other elements, such as salts and cellulose, contained in seaweed. The red seaweed is soaked for 2 hours, then after soaking, the seaweed is rewashed with running water until clean, then the seaweed is tested for pH using a PH-2011 pH meter until it obtains a pH value of 7 (neutral). The red seaweed is reduced in size to ± 4 cm in length. After reducing the size, place the red seaweed in a baking dish and dry it in a cabinet dryer at a temperature of 50°C for 24 hours. The dried red seaweed is blended until smooth and then sieved using a 60-mesh sieve until red seaweed carrageenan powder is obtained.

Jelly candy making

The procedure carried out in making jelly candy is adding cinnamon extract, which includes several stages: preparation of ingredients, cooking, moulding, cooling, and drying. Making cinnamon jelly candy refers to the modified (Marfungah et al., 2019) method, namely 45% sucrose and 40% fructose syrup, then heated at 80°C with the addition of 3.5% and 5% carrageenan, adding cinnamon powder according to the treatment. (0.5%, 1%, and 1.5%) Moreover, 1% citric acid while stirring. After mixing the ingredients evenly, the ingredients are poured into the prepared mould. Then, leave it for 10 minutes at room temperature and put it in the refrigerator for 24 hours until it solidifies and jelly candy forms. After that, the jelly candy was heated using a cabinet dryer at 50°C for 6 hours.

Physicochemical characteristic test

The physio-chemical characteristics of jelly candy observed were water content, pH test, and texture test based on the method (Marfungah et al., 2019).

Antioxidant activity test

A chemical test of the antioxidant activity (Miranti et al., 2017) of cinnamon powder jelly candy and red seaweed carrageenan using the DPPH method based on the method.

Preparation of sample solution

Weigh 5 grams of cinnamon candy and then dissolve it using 50 mL of distilled water in a measuring flask up to the mark until the jelly candy dissolves.

Preparation of 1.2 mM DPPH solution

4.8 mg of DPPH powder was weighed and put into a 20 mL measuring flask. The powder was dissolved in methanol p.a. to the extent of the miniscus and then homogenized until homogeneous.

Preparation of control solution

A total of 0.8 mL of 1.2 mM DPPH solution was pipetted and put into a test tube. Add 3 mL of distilled water, then homogenize. The control solution was incubated at 25-30˚C (room temperature) for 30 minutes (the reaction tube was wrapped in aluminium foil). Then, the solution's absorbance was measured on a UV-Vis spectrophotometer (Spectroquant prove 300) with a wavelength of 517 nm.

Preparation of test samples with various concentrations

8 mL of the diluted sample solution was taken, then put into a 20 mL measuring flask and added with distilled water to the mark. Next, 1 mL, 2 mL, 3 mL, 4 mL, and 5 mL of this solution are taken. Distilled water was added up to 20 mL to obtain test solutions with different concentration variations.

IC50 antioxidant test

Antioxidant activity was analyzed based on its ability to capture DPPH (2,2-diphenyl-1-purcylhydrazyl) free radicals. In a test tube, a 3 mL sample was added to a 0.8 mL, 1.2 mM methanol DPPH solution. Then, it was vortexed for 3 minutes and incubated at room temperature in dark conditions for 30 minutes. Next, the sample's absorbance was measured using a UV-Vis spectrophotometer (spectroquant prove 300) at a wavelength of 517 nm. Controls were made the same way using distilled water as a substitute for the sample. IC50 is calculated using a linear regression equation, with sample concentration as the y-axis. From the equation y = ax + b, it can be obtained that the IC50 value is the same as the x value.

Sensory Test

Testing was conducted descriptively (on a scale of 1-7) on cinnamon jelly candy with 50 untrained panellists. This test includes brown color, cinnamon aroma, flavor, sweet taste, cinnamon taste, aftertaste, elasticity, stickiness, and brightness.

Data analysis

ANOVA and Duncan's advanced test were used in statistical analysis. The software used in this test is SPSS 24.

RESULTS AND DISCUSSION

Physicochemical Characteristics

Water content

The results of variance testing showed that the addition of carrageenan had a significant difference in the water content of cinnamon jelly candy. Figure 1 shows the values obtained between 11.94% - 22.84%. Formulation 1 obtained a value of 22.84%, formulation 2 17.20%, formulation 3 20.16%, formulation 4 12.78%, formulation 5 17.90%, and formulation 6 11.94%. The lowest average water content value obtained in the F6 treatment was 11.94%. The highest water content of jelly candy was obtained in the F1 treatment, with a value of 22.84%. In the one-way test results, the water content of jelly candy formulations 1 and 3 showed a significant difference, whereas in formulations 2 and 5, formulations 4 and 6, there was no significant difference. The differences in each sample are due to the differences in concentration in each jelly candy formulation, so testing the water content using the wet basis method shows fundamental differences in the effect of each formulation. Below is data from water content research using the wet basis method, presented in Figure 1.

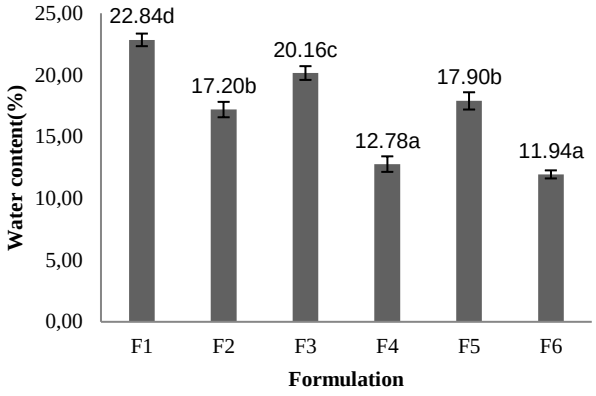

Figure 1. Jelly candy water content test results.

Description: F1 (0.5% cinnamon, 3.5% carrageenan), F2 (0.5% cinnamon, 5% carrageenan), F3 (1% cinnamon, 3.5% carrageenan), F4 (1% cinnamon, 5% carrageenan), F5 (1.5% cinnamon, 3.5% carrageenan), F6 (1.5% cinnamon, 5% carrageenan). (Values followed by different letter notations in the diagram indicate significantly different values) (One Way ANOVA Test, α = 0.05%/ F1 (0.5% cinnamon, 3.5% carrageenan), F2 (0.5% cinnamon, 5% carrageenan), F3 (1% cinnamon, 3.5% carrageenan), F4 (1% cinnamon, 5% carrageenan), F5 (1.5% cinnamon, 3.5% carrageenan), F6 (1.5% cinnamon, 5% carrageenan). Letter notations on the diagram indicate significant differences) (One Way ANOVA test, = 0.05%

Figure 1 shows that the higher the concentration of carrageenan, the resulting product will have a low water content, and adding a low concentration of carrageenan will result in a high water content. This is because carrageenan can bind large amounts of water; the literature states that carrageenan has hydrocolloid properties that can bind water. The water content of jelly candy is determined by the processing process, especially during the cooking and drying of moulded jelly candy products (Bactiar et al., 2017). The product produced on average is by the standard. That is, it should be at most 20%. However, in formulation 1, the results are not by the standard, namely 22.84%; this is because the formulation uses a cinnamon raw material concentration of 0, 5%, and 3.5% carrageenan and uses 20% water to dissolve all the jelly candy raw materials. A high water content produces a high value in jelly candy products because the substance contains too much water, and the dissolved solids during the processing process are too low. Hence, the consistency value could be more substantial. The gel-forming consistency has too few components, causing the tissue in the jelly candy product not to be strong enough to hold the liquid sugar, which causes the jelly candy to experience syneresis and produce a high water content value (Rismandari et al., 2017). According to (Atmaka et al., 2013), gel formation is a phenomenon of cross-linking between polymer chains, resulting in the formation of a three-dimensional mesh with continuity. Then, this mesh can catch the water, which causes the formation of a solid and rigid structure in the resulting product.

pH

The test was carried out using a pH meter to test the pH value obtained from the cinnamon jelly candy. After testing, the pH value produced in the cinnamon jelly candy product was classified as acidic pH because the pH value was below 7 (neutral). This acidic condition is caused by the addition of citric acid in the processing of cinnamon jelly candy. However, the amount of citric acid added to each treatment has the same composition, namely 1%. When compared with the provisions of SNI 3547-2-2008, the pH value of jelly candy is at least 3.55%, meaning the value is lower than the research results of jelly candy. The highest pH in Formulation 6 with a value of 4.82%, and the lowest value was obtained in Formulation 1 with a value of 4.47%. The primary raw materials, such as cinnamon, have an alkaline pH value of 8, and red seaweed from which carrageenan will be made has also been tested for pH with a value of 7. Data from testing the pH value using a pH meter is presented in Figure 2.

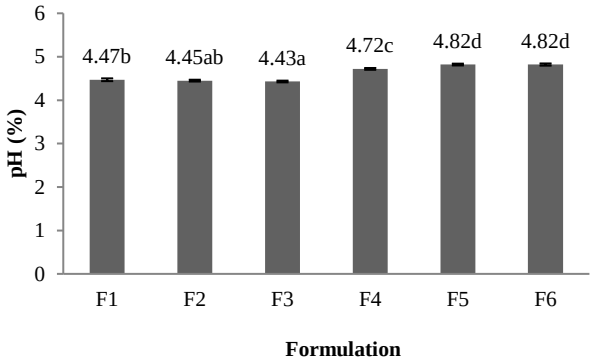

Figure 2. Jelly candy pH test results.

F1 (0.5% cinnamon, 3.5% carrageenan), F2 (0.5% cinnamon, 5% carrageenan), F3 (1% cinnamon, 3.5% carrageenan), F4 (1% cinnamon, 5% carrageenan), F5 (1.5% cinnamon, 3.5% carrageenan), F6 (1.5% cinnamon, 5% carrageenan). (Values followed by letters that are not the same in the diagram indicate significantly different values) (One Way ANOVA Test, α = 0.05%)/ F1 (0.5% cinnamon, 3.5% carrageenan), F2 (0.5% cinnamon, 5% carrageenan), F3 (1% cinnamon, 3.5% carrageenan), F4 (1% cinnamon, 5% carrageenan), F5 (1.5% cinnamon, 3.5% carrageenan), F6 (1.5% cinnamon, 5% carrageenan). (Values followed by unequal letter notations on the diagram indicate significant differences) (One Way ANOVA Test, = 0.05%)

Adding the same citric acid to each formulation showed significant fundamental differences, such as adding the same 1% citric acid. Still, each formulation of the cinnamon jelly candy had a different pH value. Formulation 1 obtained a value of 4.47%, formulation 2 obtained a pH value of 4.45%, formulation 3 obtained a value of 4.43%, formulation 4 obtained a pH value of 4.72%, formulation 5 obtained a value of 4.82%, and formulation 6 obtained the highest pH value, namely 4.82%. The increase in pH value of cinnamon jelly candy tends to increase with each formulation; this is thought to be due to the higher concentration of cinnamon powder and carrageenan being added to each formulation from the lowest formulation, namely the added concentration of 0.5% cinnamon and 3.5% carrageenan. Up to the addition of the highest concentration, namely 1.5% cinnamon and 5% carrageenan. According to (Salamah & Erungan, 2006) the average pH of jelly candy ranges from 4.5 to 6.0.

Toughness Texture Test

The results of the elasticity measurement show the elasticity value of the jelly candy produced with the addition of cinnamon and red seaweed carrageenan. Figure 3 shows the results of the elasticity test, which has a fundamental influence; the highest elasticity value was obtained in formulation 6 with a value of 2.76%, and the lowest value was obtained in formulation 1 with a value of 1.90%. The resulting value does not exceed SNI 3547-2-2008, which has a maximum value of 14%. It can be concluded that the gel-forming material can produce elasticity-based products. The elasticity value obtained by cinnamon jelly candy is due to the small volume of the product. It has undergone several processing stages, one of which is the drying process, which causes the volume to decrease. In the opinion of (Bahri et al., 2020) an increase in the water content value can cause a decrease in the elasticity value, where the water component in the product will diffuse into the gel so that the gel forms to become soft and cause the elasticity to decrease. Data from testing the texture value of the elasticity parameter is presented in Figure 3.

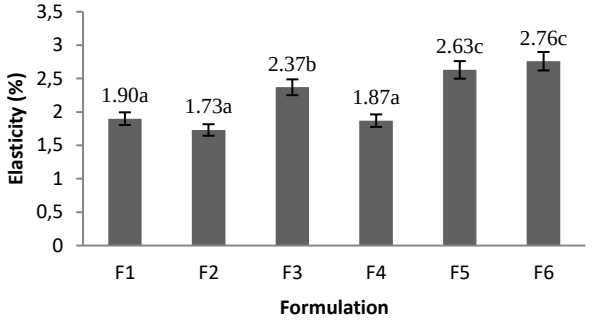

Figure 3. Elasticity test results.

Description: F1 (0.5% cinnamon, 3.5% carrageenan), F2 (0.5% cinnamon, 5% carrageenan), F3 (1% cinnamon, 3.5% carrageenan), F4 (1% cinnamon, 5% carrageenan), F5 (1.5% cinnamon, 3.5% carrageenan), F6 (1.5% cinnamon, 5% carrageenan). (Values followed by letters that are not the same in the diagram indicate significantly different values) (One Way ANOVA Test, α = 0.05%)/ F1 (0.5% cinnamon, 3.5% carrageenan), F2 (0.5% cinnamon, 5% carrageenan), F3 (1% cinnamon, 3.5% carrageenan), F4 (1% cinnamon, 5% carrageenan), F5 (1.5% cinnamon, 3.5% carrageenan), F6 (1.5% cinnamon, 5% carrageenan). (Values followed by unequal letter notations on the diagram indicate significant differences) (One Way ANOVA Test, = 0.05%)

In the cinnamon jelly candy product, formulation 1 obtained the lowest elasticity value, and the highest was obtained in formulation 6. This value also correlated with the water content value, where formulation 1 had the highest water content, and formulation 6 obtained the lowest water content value. This is reinforced by the opinion of (Novitasari et al., 2016), who stated that the water content value could influence the elasticity value of the jelly candy product produced. It can be seen from this research that the more the water content increases, the more elasticity the jelly candy will reduce.

IC50 Antioxidant Activity Test

Based on the results of the analysis of variance, it shows that the Kerinci cinnamon variety has a significant effect (α=5%) on cinnamon jelly candy, and the concentration of red seaweed carrageenan has a significant effect on jelly candy, using the DPPH (2,2 diphenyl-1-picrylhydrazyl) absorbance value method. Produced by this reduction reaction was measured at a wavelength of 517 nm. Figure 4 shows that the Kerinci variety cinnamon and the concentration of red seaweed carrageenan influence the amount of antioxidants. According to (Marfungah et al., 2019), a compound is said to have a powerful antioxidant if the IC50 value is less than 50 µg/ml, substantial if the IC50 value is 50 µg/ml to 100 µg/ml, while if the IC50 value is 100 µg/ml to 150 µg/ml, weak if IC50 is 151 µg/ml to 200 µg/ml, inactive if IC50 is more than 500 µg/ml. In the jelly candy product, formulation 1 obtained an IC50 value of 50.266 µg/ml with a concentration of 0.5% cinnamon and 3.5% carrageenan, and the highest IC50 value was obtained in Formulation 6 with a value of 64.823 µg/ml with a concentration of 1.5% cinnamon, 5% carrageenan. This shows that the higher the concentration of cinnamon and the addition of carrageenan will affect the antioxidant activity values obtained. These data also show that formulations 1 to 6 have active antioxidant activity. The addition of red seaweed carrageenan also affects the antioxidant activity value because red seaweed also contains polyphenolic compounds, which can potentially contain antioxidants (Amelia & Tanod, 2016). Red seaweed carrageenan has antioxidant compounds, which influence the antioxidant activity value of jelly candy. This is also because carrageenan has more hydroxyl groups, so carrageenan can form a higher double helix structure and protect antioxidant compounds in the three-dimensional matrix from heat and oxygen. (Bactiar et al., 2017) stated that carrageenan can protect phenolic compounds from increasingly vital heating processes so that phenolic compounds do not experience much damage. So, the more components of carrageenan concentration that are added, the higher the antioxidant compound value of a product. Data from IC50 antioxidant research are presented in Figure 4.

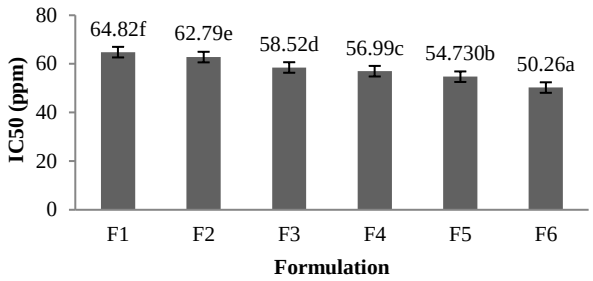

Figure 4. Antioxidant activity test results.

Description: F1 (0.5% cinnamon, 3.5% carrageenan), F2 (0.5% cinnamon, 5% carrageenan), F3 (1% cinnamon, 3.5% carrageenan), F4 (1% cinnamon, 5% carrageenan), F5 (1.5% cinnamon, 3.5% carrageenan), F6 (1.5% cinnamon, 5% carrageenan). (Values followed by letters that are not the same in the diagram indicate significantly different values) (One Way ANOVA Test, α = 0.05%)/ F1 (0.5% cinnamon, 3.5% carrageenan), F2 (0.5% cinnamon, 5% carrageenan), F3 (1% cinnamon, 3.5% carrageenan), F4 (1% cinnamon, 5% carrageenan), F5 (1.5% cinnamon, 3.5% carrageenan), F6 (1.5% cinnamon, 5% carrageenan). (Values followed by unequal letter notations on the diagram indicate significant differences) (One Way ANOVA Test, = 0.05%)

Red seaweed carrageenan has antioxidant compounds, which influence the antioxidant activity value of jelly candy. This is also because carrageenan has more hydroxyl groups, so carrageenan can form a higher double helix structure and protect antioxidant compounds in the three-dimensional matrix from heat and oxygen. (Bactiar et al., 2017) Stated that carrageenan can protect phenolic compounds from increasingly vital heating processes so that phenolic compounds do not experience much damage. So, the more components of carrageenan concentration are added, the higher the antioxidant compound value of a product. Adding Koerintji variety cinnamon also influences the antioxidant activity value of jelly candy products. Koerintji variety cinnamon itself has a very high cinnamaldehyde content of around 91.88 - 94.19%, exceeding the SNI standard of 50%, because this cinnamaldehyde compound will play an active role in antioxidant activity. The weak value of antioxidant activity compounds obtained in cinnamon jelly candy products is thought to be influenced by the mixing of additional ingredients such as sugar, gelling agents, and citric acid. It is strengthened due to a processing process. The processing of cinnamon jelly candy in this study used a temperature of 50˚C during the product drying process in a cabinet dryer. This is supported by (Marfungah et al., 2019), who states that heat treatment when processing jelly candy can reduce the levels of antioxidant compounds by 18% - 43%. This is to the research results of (Hayulistya et al., 2021), stating that the activity value of antioxidant compounds obtained in black cumin jelly candy is relatively low, namely obtaining a value between 0.45-3.48%; this occurs because there are various process stages required In

processing black cumin jelly candy, namely cooking, and drying.

Sensory Test

This hedonic sensory testing method using 50 untrained panelists is used to determine the subjective attitudes of panelists or potential consumers towards a product produced and assessed based on organoleptic parameters. The results obtained are in the form of acceptance (accepted or rejected), liking (level of like/dislike), and choice (choose one over another) towards the product (Oktafa et al., 2017). This test is usually carried out by comparison to the test of choice. Panellists or potential consumers are then instructed to choose one example they like from several examples presented. The data in (Table 1) shows no real difference in color parameters. This shows that formulation 1, formulation 2, and formulation 4 are the colours the panelists prefer. Meanwhile, formulation 3, formulation 5, and formulation 5 show the neutral value chosen by the panellists. However, the highest score was obtained for formulation 2, which shows that the panelists liked the jelly candy product formulation 2 with a formulation of 0.5% cinnamon and 5% carrageenan. Data from hedonic sensory testing results are in Table 1.

Table 1. Hedonic sensory test results.

Formulation	Colour	Aroma	Flavour	Texture	Taste	Overall
F1	5,06 ± 1,25^{a}	4,26 ± 0,85^{a}	4,68 ± 1,05a	4,08 ± 1,39^{ab}	5,22 ± 1,13^{a}	5,14 ± 0,98^{a}
F2	5,10 ± 1,14^{a}	4,26 ± 1,08^{a}	4,58 ± 1,12^{a}	4,74 ± 0,87^{bc}	5,20 ± 0,96^{a}	5,06 ± 1,03^{a}
F3	4,88 ± 1,17^{a}	4,12 ± 1,00^{a}	4,44 ± 1,14^{a}	3,88 ± 1,28^{a}	4,86 ± 1,06^{a}	4,46 ± 1,03^{a}
F4	5,08 ± 1,22^{a}	4,36 ± 0,98^{a}	4,48 ± 1,07^{a}	4,48 ± 1,21^{ab}	4,96 ± 1,06^{a}	5,02 ± 1,02^{a}
F5	4,60 ± 1,32^{a}	4,46 ± 1,05^{a}	4,68 ± 1,30^{a}	4,84 ± 1,28^{c}	5,06 ± 1,21^{a}	4,96 ± 1,19^{a}
F6	4,66 ± 1,02^{a}	4,32 ± 1,11^{a}	4,66 ± 1.37^{a}	4,56 ± 1,26^{bc}	4,80 ± 1.29^{a}	4,84 ± 1,20^{a}

Description: F1 (0.5% cinnamon, 3.5% carrageenan), F2 (0.5% cinnamon, 5% carrageenan), F3 (1% cinnamon, 3.5% carrageenan), F4 (1% cinnamon, 5% carrageenan), F5 (1.5% cinnamon, 3.5% carrageenan), F6 (1.5% cinnamon, 5% carrageenan). (Values followed by letters that are not the same in the diagram indicate significantly different values and not significantly different values) (One Way ANOVA Test, α = 0.05%)/ F1 (0.5% cinnamon, 3.5% carrageenan), F2 (0.5% cinnamon, 5% carrageenan), F3 (1% cinnamon, 3.5% carrageenan), F4 (1% cinnamon, 5% carrageenan), F5 (1.5% cinnamon, 3.5% carrageenan), F6 (1.5% cinnamon, 5% carrageenan). (Values followed by unequal letter notations on the diagram indicate significant differences) (One Way ANOVA Test, = 0.05%)

The panelists' overall assessment of the organoleptic test includes cinnamon jelly candy's colour, taste, aroma, and texture. Parameter numbers 1 (dislike very much), 2 (dislike), 3 (dislike somewhat), 4 (neutral), 5 (somewhat like), 6 (like), 7 (like very much). The results of the overall assessment by the panellists in the organoleptic test on the color, taste, aroma, and texture of jelly candy can be seen in (Table 1) which has been statistically tested using the One Way method (α=0.05%) and does not show any fundamental differences between the cinnamon breeds. Jelly candy in various formulations. However, the highest overall favorability rating was obtained for F1, namely 5.14. In this formulation, the components consist of 0.5% cinnamon and 3.5% carrageenan, thus showing that the product that the panelists prefer is F1.

CONCLUSIONS

The chemical properties of cinnamon jelly candy change with the addition of varying concentrations of red seaweed carrageenan. The antioxidant test with a substantial value is formulation 6, with a value of 50.26%, adding 1.5% cinnamon and 5% red seaweed carrageenan.

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Authors' Contributions: Conceptualization, ES.; methodology, E.S..; software, I.M.; validation, A.R.A; formal analysis, I.M.; resources, R,M.D.U; data curation, A.R.A.; carried out the laboratory work: E.S, writing—original draft preparation, E.S.; writing—review and editing, R.M.D.U.; visualization, E.S.; supervision, R.M.D.U, I.M. and A.R.A.; project administration, E.S.; funding acquisition, E.S. All authors read and approved the final version of the manuscript

Competing Interests: The authors declare that there are no competing interests.

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