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Organoleptic Test of Ginger Flavor Seaweed (Eucheuma cottonii) Jelly Candy

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ABSTRACT

Eucheuma cottonii is a seaweed cultivated in Galo-Galo Village, South Morotai District, Morotai Island Regency. The seaweed, Eucheuma cottonii, has not yet been processed into semi-finished or finished products. One of its components, carrageenan, can form a gel, which can then be used to create various products such as agar, dodol, and jelly candy. This study aimed to convert Eucheuma cottonii seaweed into jelly candy and to analyze consumer acceptance of the resulting product. A qualitative research method was employed for this study, with samples of *Eucheuma cottonii* collected from Galo-Galo Village. Ginger and citric acid were added as natural flavorings to enhance the candy's flavor and mask the seaweed's fishy taste. Before conducting the organoleptic test on the jelly candy, a preliminary study was conducted to determine the optimal formula. The organoleptic test used 60 untrained panelists. The results showed that the right formula for making jelly candy was to use 300 g of *Eucheuma cottonii*, 500 g of sugar, 300 g of gelatin, and 0.75 g of citric acid. The results of the organoleptic assessment by 60 panelists showed that Eucheuma cottonii jelly candy has a rather bright color, chewy texture, and pleasing to delicious taste. Thus, this study's results can positively contribute to the local economy and introduce new healthy and nutritious products to the community.

Keywords: Seaweed, *Eucheuma cottonii*, Jelly candy, Ginger flavored candy, Organoleptic

ABSTRAK

Eucheuma cottonii merupakan salah satu jenis rumput laut yang dibudidayakan di Desa Galo-Galo, Kecamatan Morotai Selatan, Kabupaten Pulau Morotai. Namun, belum diolah menjadi produk setengah jadi atau produk jadi. Salah satu kandungan yang terdapat dalam rumput laut adalah karagenan yang mampu membentuk gel, sehingga dapat diolah menjadi berbagai olahan agar, dodol, permen jeli dan sebagainya. Tujuan dilakukan penelitian ini adalah mengolah rumput laut *Eucheuma cottonii* menjadi permen jeli dan menganalisis tingkat penerimaan konsumen terhadap permen jeli *Eucheuma cottonii*. Penelitian ini menggunakan metode kualitatif. Sampel *Eucheuma cottonii* diperoleh dari Desa Galo-Galo. Dalam pembuatan permen, ditambahkan jahe dan asam sitrat sebagai perasa alami dan menghilangkan rasa amis dari rumput laut. Sebelum dilakukan uji organoleptik terhadap permen jeli, dilakukan penelitian pendahuluan untuk menentukan formula terbaik. Uji organoleptik dengan menggunakan panelis tidak terlatih sebanyak 60 orang. Hasil penelitian menunjukkan bahwa formula yang tepat untuk pembuatan permen jeli yaitu menggunakan *Eucheuma cottonii* 300 g, gula 500 g, gelatin 300 g, asam sitrat 0,75 g. Dari hasil penilaian organoleptik oleh 60 panelis mnenunjukkan bahwa permen jeli *Eucheuma cottonii* berwarna agak cerah hingga cerah, tekstur kenyal, dan rasa enak hingga sangat enak. Sehingga, hasil dari penelitian ini dapat memberikan kontribusi positif bagi perekonomian lokal dan memperkenalkan produk baru yang sehat dan bergizi kepada masyarakat.

Kata kunci: Rumput laut, *Eucheuma cottonii*, Permen jeli, Permen rasa jahe, Organoleptik

INTRODUCTION

Eucheuma cottonii is a species of Rhodophyta (red seaweed) with a thallus with cylindrical or flat branches. These branches are irregular and rough, which is caused by the growth of the Nodulla and Spine that protect the gametes. This seaweed is a raw material widely used to make agar-agar, carrageenan, and alginate (Aslan, 2005). Agar-agar, carrageenan, and alginate have wide applications in the textile, cosmetic, and food industries (Liao et al., 2021; Rhein-Knudsen & Meyer, 2021; Ridlo et al., 2023). One important component of seaweed is carrageenan, which can form a gel. Thus, the local community can use these ingredients to make seaweed-based candy, which consumers increasingly demand.

In Galo-Galo Village, South Morotai District, Morotai Regency, *Eucheuma cottonii* is widely cultivated. Although this seaweed is usually sold in wet or dry form, farmers face obstacles in marketing their harvest because they must sell it outside the region. Research by Sari et al. (2021) shows that processing seaweed into food products can increase added value and farmers' income. However, the community of Galo-Galo Village has not processed seaweed into ready-to-eat products that tourists or local people can consume directly or use as souvenirs. However, *Eucheuma cottonii* has been processed into ice, sweets, and jelly candy products.

Jelly candy is made from sugar (sucrose), gelatin (carrageenan), and additional organic ingredients such as ginger, often used as a preservative and natural flavoring. This confectionery product is in great demand by the public, not only among children but also adults (Syafutri et al., 2010; Yustina & Antarlina, 2013). Research shows that jelly candy with ginger composition has excellent market potential if produced commercially. Ginger contains active compounds such as zingiberone, oleoresin, bisabolene, camphene, linalool, geranial, and borneol, which can be used as aroma and flavor enhancers in food products. However, one of the challenges in using *Eucheuma cottonii* is the fishy smell and taste that often accompanies it. Research by Halim et al. (2022) shows that citric acid can neutralize the taste and provide freshness to food products. Citric acid gives a distinctive sour taste to food and drinks, so it is often added to candy, soft drinks, and other food products. Sweis and Cressey (2018) explained that citric acid is a food additive in drinks, snacks, jelly, chips, and other processed foods. Therefore, this study aims to find an alternative to eliminate the fishy smell and taste by using citric acid and ginger. Adding ginger can improve the taste and provide health benefits, such as antioxidant and antiemetic properties (Kurniasari et al., 2013).

Organoleptic testing is an important method for evaluating the quality of food products, including jelly candies. Through this test, consumers can assess sensory attributes such as taste, aroma, texture, and appearance. Research by Pratiwi et al. (2021) shows that organoleptic testing can provide valuable insights into consumer preferences for new products. This study will conduct organoleptic testing to evaluate consumer acceptance of jelly candies made from *Eucheuma cottonii* with added ginger and citric acid.

Thus, this study aims to develop innovative jelly candies and provide solutions for seaweed farmers in Galo-Galo Village to increase the added value of their crops. Hopefully, this study's results can positively contribute to the local economy and introduce new healthy and nutritious products to the community. It is hoped that jelly candies made from *Eucheuma cottonii* will be an appealing and beneficial alternative for consumers.

METHODOLOGY

This research was conducted from November to December 2022 at the Faculty of Fisheries and Marine Sciences Laboratory, Morotai Pacific University.

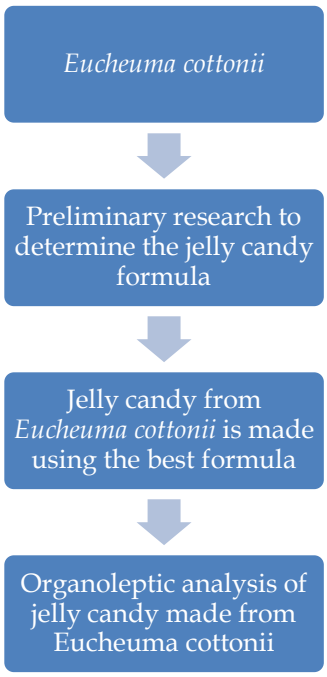

Figure 1. Research flowchart

Instruments and Materials

The raw material used in this study was *Eucheuma cottonii* seaweed as the main ingredient, which was obtained from Galo-Galo village. Granulated sugar, gelatin, ginger, water, and citric acid are other ingredients. The tools used include basins, measuring cups, mixing spoons, blancu cloth, pans, stoves, measuring cups, scales, tins, stainless steel spoons, and knives.

Procedures

1. Sample preparation; The dried *Eucheuma cottonii* seaweed is washed 4-5 times in the last wash using warm water. After that, the seaweed that has been washed is clean. Blend until smooth with the addition of a little water, then weigh according to the formula. After being weighed, put in plastic and stored in the refrigerator. Apart from *Eucheuma cottonii* seaweed, another ingredient prepared is ginger. The ginger is washed, then peeled and washed again until clean, and after cleaning, the ginger is blended with a little water until smooth. After the ginger is smooth, transferred to plastic and weighed according to the formula. After weighing the ginger, put it in the refrigerator.
2. Preliminary research; Preliminary research was conducted to find the best *Eucheuma cottonii* jelly candy formula. The formula used is as follows.
   Eucheuma cottonii 300 g, 500 g sugar, 300 g gelatin, and 0.75 g
   A = *E. cottonii* 600 g + ginger 100 g + sugar 1000 g
   B = *E. cottonii* 600 g + ginger 100 g + sugar 1000 g + gelatin 100 g
   C = *E. cottonii* 600 g + ginger 100 g + sugar 1000 g + gelatin 200 g
   D = *E. cottonii* 600 g + ginger 100 g + sugar 1000 g + gelatin 300 g
   E = *E. cottonii* 600 g + ginger 100 g + sugar 1000 g + tapioca flour 100 g
   F = *E. cottonii* 600 g + ginger 100 g + sugar 1000 g + swallow jelly 7 g
   G = *E. cottonii* 300 g + ginger 100 g + sugar 500 g + gelatin 300 g + citric acid 0.75 g.
3. Organoleptic testing of seaweed jelly candy; This test was carried out using an organoleptic test for jelly candy products. This test was carried out by 60 panelists, lecturers, students, homemakers, and men. The organoleptic values assessed included the jelly candy's color, flavor, and texture.

Table 1. Scores for indicators of color, flavor, and texture of jelly candy

Scores	Indicators		
	Color	**Flavor**	**Texture**
5	Very bright	So very delicious	Very chewy
4	Bright	Very delicious	Chewy
3	Rather bright	Delicious	Somewhat chewy
2	Not bright	A bit unpalatable	Not chewy
1	Not very bright	Not delicious	Not very chewy

Data Analysis

The jelly candy organoleptic test results are displayed in pictures, then analyzed descriptively and qualitatively.

RESULTS AND DISCUSSION

Processing of Ginger Flavor Jelly Candy

This study focuses on using Eucheuma cottonii as a basic ingredient for making ginger-flavored jelly candy. The results of the seven formulas tested showed variations in texture and taste, which were influenced by the composition of the ingredients and the manufacturing process. The addition of gelatin, for example, provides a chewy texture to jelly candy. According to Kaur et al. (2020), gelatin is a thickening agent commonly used in candy making because of its ability to form a stable gel and provide the desired texture.

Figure 2. Ginger seaweed jelly candy dough.

In the second formula, adding 100 grams of gelatin and 0.75 grams of citric acid produced candy with a fairly chewy texture and a balanced taste without leaving the fishy smell of Eucheuma cottonii. Citric acid is a natural preservative and sour flavor enhancer that can improve the product's taste (Baker et al., 2019). Research by Rojas et al. (2021) also shows that citric acid can help reduce the fishy smell of marine-based products.

The third and fourth formulas showed that increasing the amount of gelatin (200 grams and 300 grams) resulted in a more complex texture and was difficult to chew. This is in line with the findings by Ghosh et al. (2018), which stated that increasing gelatin concentration can lead to increased gel stiffness, which may be undesirable in jelly candy products. In contrast, the fifth formula, using 100 grams of tapioca flour and 0.75 grams of citric acid, produces a texture similar to dodol, which is neither hard nor chewy. Tapioca flour is a thickener that softens the product (Sari et al., 2020). Research by Wang et al. (2022) shows that tapioca flour can increase the softness and elasticity of food products.

The sixth formula, which uses 7 grams of agar-agar, also produces a texture similar to dodol, indicating that agar-agar can be a good alternative to gelatin in making jelly candy. According to Sari et al. (2020), agar-agar has good gel properties and can provide the desired texture to food products. The seventh formula, using 300 grams of Eucheuma cottonii, 500 grams of sugar, 300 grams of gelatin, and 0.75 grams of citric acid, produces a perfect texture with the proper elasticity. It shows that the right combination of ingredients can produce products that are not only delicious but also visually appealing. Research by Kaur et al. (2020) emphasizes the importance of ingredient proportions in achieving optimal product quality. Overall, this study shows that using Eucheuma cottonii in making ginger-flavored jelly candy can be done with various formula variations, and the selection of ingredients and the right proportions significantly affect the final product results.

Organoleptic Quality Test of Seaweed Jelly Candy

Quality test in this study is to use organoleptic tests. In this test, 60 untrained panelists (consisting of lecturers, students, and homemakers) were used. While the parameters tested were color, texture, and flavor.

Color

Color is one of food items' most significant physical parameters, playing a critical role in consumer perception and preference. The visual appeal of a food product is often the first aspect that catches consumers' attention, influencing their purchasing decisions even before taste and texture come into play. As noted by Rahayu (2001), food color is determined by the light absorbed and reflected by the item, which a variety of dimensional factors, including product color, brightness, and clarity can influence. This interaction between light and color perception is critical to understanding how consumers interact with food products. Research by Kahn et al. (2018) suggests that color can influence taste perception, with brighter colors often associated with sweeter flavors.

The color of food items is not just an aesthetic feature; it carries more profound implications for quality and safety. For example, bright colors often indicate freshness and nutritional value, while dull or abnormal colors can signal spoilage or poor quality. This relationship between color and quality is particularly evident in fruits and vegetables, where consumers associate rich colors with ripeness and flavor. For example, the bright red color of a ripe tomato indicates that it is sweet and ready to eat, while a greenish or yellowish color may indicate that the tomato is not yet ripe or is past its peak (Kumar et al., 2020).

In confections, such as jelly beans, color plays a significant role in consumer acceptance and enjoyment. The addition of ginger, for example, significantly affects the color of jelly beans, as the natural pigments in ginger extract contribute to the product's overall appearance. A comparison of the percentages of ginger extract and carrageenan in jelly bean production shows how these ingredients affect the flavor and visual appeal. Ginger's natural color, which can range from pale yellow to deep orange, provides a unique basis for the color profile of the final

product (Zhang et al., 2021). Furthermore, the browning reactions that occur during the jelly bean manufacturing process add to the complexity of the color. The Maillard reaction, which occurs between amino acids and reducing sugars when heated, can produce a variety of brown shades, adding depth to the visual appeal of the candy. It is especially relevant when sugar is added to the mix, as the caramelization process turns the sugar into a rich brown color that complements the ginger extract. Buckle et al. (2007) emphasize that cooking at high temperatures for extended periods can cause this type of caramelization, affecting the color and contributing to the candy's flavor profile.

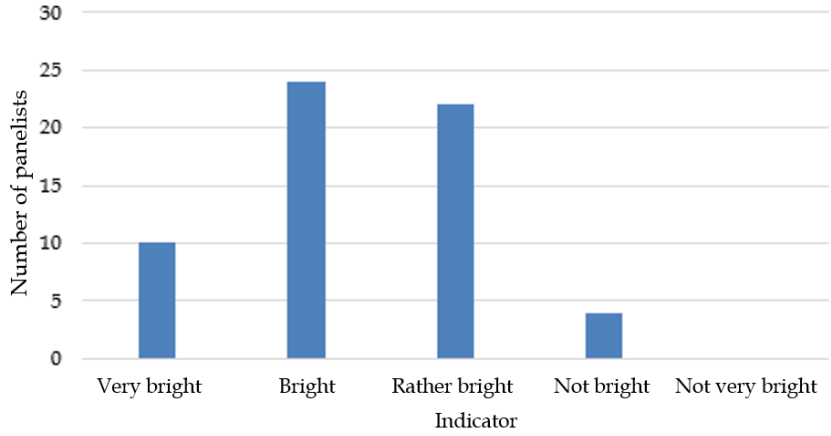

Figure 3. Organoleptic results of ginger-colored seaweed jelly candy

In the sensory evaluation of seaweed ginger jelly candy, the organoleptic assessment of color revealed a variety of consumer perceptions. Of the panelists, 10 individuals rated the candy as very bright (16.7%), while 24 rated it as bright (40%), 22 as moderately bright (36.7%), and four participants considered it not bright (6.6%). Interestingly, there was no rating for "very not bright," indicating a generally positive acceptance of the color among the panelists. The average organoleptic value of 3.7 indicated that seaweed ginger jelly candy was considered slightly bright to bright, confirming its visual appeal (Arifin, 2019). This finding aligns with a study by Arifin (2019), which reported that adding 10% gelatin to melon jelly candy resulted in similar organoleptic color values. This consistency across studies emphasizes the importance of ingredient proportions and processing methods in determining the final product's color. The interaction between ginger extract and sugar affects the visual characteristics and enhances the jelly candy's overall sensory experience (Kumar et al., 2020).

The significance of color in food products goes beyond aesthetics; it also reflects cultural and psychological dimensions. Different cultures have different associations with color, which can influence consumer preferences. For example, in many Asian cultures, red is associated with good luck and happiness, making red foods particularly appealing during festive occasions (Lee et al., 2021). This cultural context adds another layer of complexity to understanding color preferences in food. The psychological effects of color on consumer behavior are significant and should not be overlooked. Research indicates that color can evoke specific emotions and perceptions, influencing how individuals perceive tastes and flavors. For instance, warm colors like red and orange stimulate appetite, while cool colors like blue may suppress it (Kahn et al., 2018). These psychological factors are essential for food marketers and product developers as they aim to create products that resonate with their target audiences.

In addition to consumer perception, the color of food products can also serve as a quality indicator for manufacturers. Consistency in color across batches can signal adherence to quality control standards, ensuring that consumers receive a product that meets their expectations.

Conversely, inconsistent color can raise concerns about the production process and quality of ingredients, potentially leading to a loss of consumer trust (Zhang et al., 2021). The role of color in food presentation is also critical in the culinary arts. Chefs and food stylists often carefully consider color combinations when presenting dishes, as vibrant colors can enhance the overall dining experience. The visual appeal of a dish can make it more appetizing, encouraging consumers to engage with the food on a sensory level. This practice is particularly relevant in fine dining, where presentation is often as important as taste (Lee et al., 2021).

In conclusion, the color of food ingredients, especially in products such as jelly beans, is a multifaceted aspect influencing consumer perception, quality judgment, and cultural significance. The interplay between natural pigments, processing methods, and consumer preferences creates a complex landscape that food manufacturers must navigate. Through a deeper understanding of the role of color, manufacturers can enhance the appeal of their products, ultimately leading to greater consumer satisfaction and loyalty. As research continues to explore the nuances of color in food, it becomes increasingly clear that this physical parameter is more than a surface characteristic; it is integral to the overall food experience.

Texture

The texture of jelly candy is influenced by several factors, including sugar content, moisture content, and the drying technique used. The drying technique used in making ginger jelly candy is traditionally done by drying in the sun so that pure sucrose can form a hard crystal texture quickly if the drying process is not carried out properly (Putri et al., 2019; Mandei, 2014). An improper drying process can cause excess moisture, which in turn can affect the final texture of the jelly candy. According to research by Rahayu et al. (2020), high moisture in jelly products can cause a sticky and undesirable texture, reducing consumer appeal.

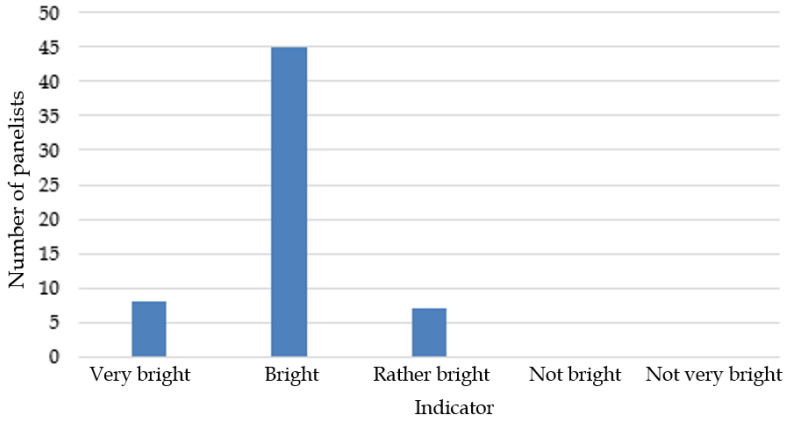

Figure 4. Organoleptic results of ginger-textured seaweed jelly candy

Texture in organoleptic is a sensation felt through sight, touch, and chewing (Wahyuni, 2017). Organoleptic assessment of the texture of seaweed ginger jelly candy showed that the number of panelists who gave a very chewy rating was eight people (13.3%), chewy 45 people (75%), slightly chewy seven people (11.6%), and not chewy and not very chewy 0%. Overall, the average organoleptic value for the texture of jelly candy was 4.0, which indicates that the texture of seaweed ginger jelly candy is on the chewy indicator. This finding aligns with research by Salamah et al. (2006) and Harijono et al. (2001), which stated that high levels of carrageenan produce a firm jelly candy texture.

As a natural thickener, carrageenan can form a stable gel and provide the desired texture to food products. Research by Ghosh et al. (2018) showed that variations in carrageenan concentration

in making jelly candy can affect the strength and elasticity of the gel, which contributes to the final texture of the product. In addition, research by Kaur et al. (2020) emphasized that the interaction between carrageenan and sugar also plays an important role in determining the texture, where the right proportion can produce chewy and non-sticky jelly candy.

Sugar content also plays an important role in determining the texture of jelly candy. Sugar not only functions as a sweetener but also contributes to the formation of a stable gel structure. According to research by Zhang et al. (2021), increasing the sugar content in the jelly mixture can increase the gel strength, affecting the final texture. Therefore, selecting the right ingredients and proportions is crucial to achieve the desired texture in jelly candy products. Overall, this study shows that the drying technique, carrageenan content, and sugar content greatly influence the texture of seaweed ginger jelly candy. By understanding these factors, manufacturers can optimize the manufacturing process to produce jelly candies with the desired texture, ultimately increasing consumer satisfaction.

Flavor

According to Fellow (2000) in Sanjaya (2016), taste is an important factor because taste is the tongue's response to food that greatly determines the consumer's final decision to accept or reject a food. Paimin (1991) stated that ginger contains oleoresin, which consists of gingerol, shogaol, and resin components, which cause the spicy taste of ginger. Taste is influenced by several factors, namely chemical compounds, temperature, concentration, and interaction with other taste components. Sucrose produces a sweet taste in jelly candy, ginger provides a spicy taste, while a sour taste is obtained from citric acid. Research by Kaur et al. (2020) shows that the interaction between these taste components can affect the overall perception of the product's taste, where the balance between sweet, spicy, and sour tastes is essential to create a pleasant taste experience.

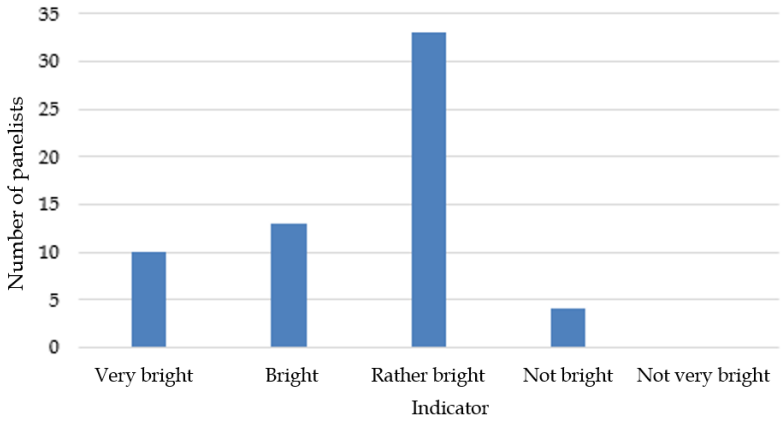

Figure 5. Organoleptic results of ginger-flavored seaweed jelly candy

The results showed that the number of panelists who gave organoleptic assessments of the taste of seaweed ginger jelly candy with a rating of very delicious was ten people (16.6%), very delicious 13 people (21.6%), delicious 33 people (55%), rather unpleasant four people (6.6%), and unpleasant zero people (0%). Overall, the average organoleptic value for the taste of jelly candy was 3.5, which indicates that the taste of seaweed ginger jelly candy is in the good to very good indicator. This finding aligns with research by Harijono et al. (2001), which stated that panelists preferred an increase in high carrageenan levels because carrageenan produces a potent gel and a sweet taste appropriate for the resulting jelly candy. Eveline et al. (2011) stated that the salty taste of jelly candy can be caused by a thickening agent derived from carrageenan or gelatin. Research by Ghosh et al. (2018) also showed that the use of carrageenan in making

jelly candy affects the texture and contributes to the overall flavor profile. In contrast, carrageenan can provide more complex flavor nuances. In addition, research by Zhang et al. (2021) emphasized that flavor components derived from natural ingredients, such as ginger, can enhance the sensory appeal of the product, making it more attractive to consumers.

The gingerol and shogaol content in ginger contributes to its distinctive spicy flavor, which can enhance the overall taste experience. Research by Rojas et al. (2021) showed that adding ginger to food products can enhance taste perception and provide a new dimension to flavor, which is very important in products such as jelly candy. Thus, combining the sweetness of sucrose, the spiciness of ginger, and the sourness of citric acid creates an attractive and acceptable flavor balance for consumers. Overall, this study shows that the flavor of seaweed ginger jelly candy is greatly influenced by the composition of the ingredients, the interaction between the flavor components, and the proper proportions. By understanding these factors, manufacturers can optimize the formulation to achieve the desired flavor, ultimately increasing consumer satisfaction.

CONCLUSION

Based on the research results, the right formula for making jelly candy is 300 g of Eucheuma cottonii, 500 g of sugar, 300 g of gelatin, and 0.75 g of citric acid. The average organoleptic value of the color of the jelly candy is at a value of 3.7, indicating that the color of the ginger-flavored seaweed jelly candy is on the slightly bright to bright indicator. The average organoleptic value of the texture of the jelly candy is at a value of 4.0, indicating that the texture of the ginger-flavored seaweed jelly candy is on the chewy indicator. The average organoleptic value of the taste of the jelly candy is 3.5, indicating that the taste of the ginger-flavored seaweed jelly candy is on the good to excellent indicator, so this jelly candy meets the requirements of SNI 3547.2: 2008. Thus, this study aims to develop innovative jelly candy products and provide solutions for seaweed farmers in Galo-Galo Village to increase the added value of their harvest. Thus, this research's results can positively contribute to the local economy and introduce new healthy and nutritious products to the community.

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