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Sensory Profiling of Jelly Drink Made from a Combination of Bay Leaf Water Extract and Guava Juice Using a Quantitative Descriptive Analysis

Profil Sensori Minuman Jeli Ekstrak Air Daun Salam Kombinasi Jus Jambu Menggunakan Quantitative Descriptive Analysis

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ABSTRACT

Background: The profiling of a drink made from bay leaves combined guava juice has not been previously reported despite the positive health aspects of both plants.
Objectives: To analyze the sensory characteristics of jelly drink bay leaf water extract with guava juice combination using the Quantitative Analysis Descriptive (QDA) sensory evaluation method.
Methods: The QDA carried out of three stages, namely the panelist preparation stage, Forum Group Discussion (FGD), and quantitative descriptive test. QDA was carried out on four jelly drink product formulas, namely F0 (standard), F1 (75:25), F2 (50:50), F3 (25:75) from the ratio of bay leaf extract:guava juice.
Results: Sensory attributes consist of 17 attributes, namely appearance (particle aggregation size, viscosity, homogeneity), aroma (bay leaf, guava, sweet), texture (gritty, ease of spreading), taste (guava, sweet, sour, bay leaf), mouthfeel (gritty, jelly-like consistency, viscosity), aftertaste (astringent and bitter). The results of the one-way ANOVA analysis showed significant differences between the formula and the control product ($p<0.05$). Formula 1 and 3 not accepted by consumers because there are weaknesses, such as the inhomogeneous appearance and the strong aroma of bay leaf obtained the highest value in formula 1. In contrast, formula 3 has the highest value in astringent and bitter aftertaste, gritty texture and mouthfeel.
Conclusions: The selected treatment is formula two of jelly drink with a ratio of bay leaf water extract: guava juice = 50:50. A description like this will assist food technology in developing new products.

INTRODUCTION

In recent years, consumer demand for healthy and functional beverages has increased significantly. The jelly drink is a popular and well-liked type of nutritious beverage among a wide range of people[1]. Due to its low calorie, low fat, and high fiber content[2]. The jelly drink has a soft gel-like consistency, making it convenient to consume as a beverage[3]. A jelly drink was produced by bay leaf water extract combining guava juice and glucomannan. This resulted in the production of value-added and functional foods and a gel with an improved texture, have become one of the products attracting attention in the market.

Bay leaf contains various active components that can regulate the function of insulin, glucose, and lipid metabolism[4–11]. Bay leaf polyphenols and flavonoids can prevent or alleviate metabolic disorders and regulate body composition[12]. Phytonutrients and their bioactive compounds can decrease the risk of developing chronic diseases and enhance their control when consumed as part of a well-balanced diet[13].

The guava fruit possesses significant potential due to its exceptional nutritional value, pleasing taste, palatability, and availability at a reasonable cost[14]. The significant antioxidant activity of guava fruit is responsible for its anti-hyperglycemic effect. The guava fruit holds promise for creating dietary supplements

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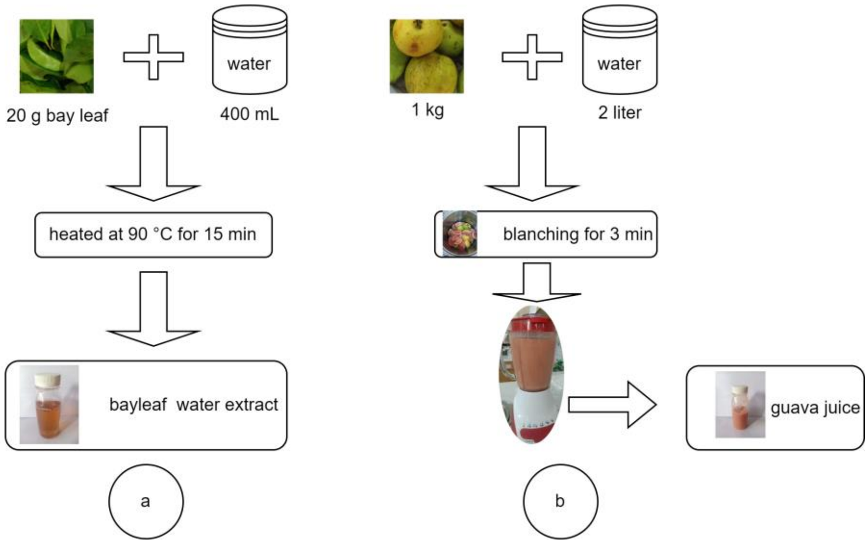
specially designed for individuals with diabetes[15]. Guava fruit can inhibit oxidative damage and reduce inflammation-induced high blood sugar levels linked to long-term complications of diabetes[16]. The water extract from guava fruit shows potential as a suitable option for functional beverages in individuals with prediabetes and diabetes[17]. Guava has become a popular ingredient in the food industry, especially in Japan and China, where it is used to produce healthy beverages[18].

The profiling of a food product or beverage created by combining bay leaves and guava juice has not been documented despite the known health benefits of both plants. Hence, there is an immediate need for comprehensive research aimed at creating jelly beverages that align with consumer preferences. This study used a group of trained panelists to analyze and describe the main sensory profiling. The discussion also includes the performance of the panelists in conducting tests and the reliability of the tests. Furthermore, assessments of the jelly drink's performance are conducted about its existing competitors. This study aimed to analyze the sensory profiling of a jelly drink made from a combination of bay leaf water extract and guava juice using the QDA sensory evaluation method.



a: Bay leaf water extract; b: Guava juice extraction
Images 1. Procedure of bay leaf water extract and guava juice

METHODS

Materials

The raw materials utilized included mature bay leaves (*Syzygium polyanthum*) harvested from the fifth leaf of the shoots[19] and fresh red guava (*Psidium guajava*) fruits of optimal maturity[20]. Free from any indications of mold, pests, or diseases. The United States Department of Agriculture identified the plant, and a nomen number was assigned to each plant: bay leaf and fresh red guava, 84449 and 27240, respectively. The raw material was obtained from Pemberdayaan and Kesejahteraan Keluarga (PKK) Agropark Lampung, Sabah Balau, South Lampung Regency, Lampung (latitude 5°22'39.1"S, longitude 105°19'07.8"E). Ikarie from Yogyakarta is the producer of glucomannan, while Shandong Shengxiangyuan Biotechnology Co., Ltd produces stevia extract powder. The company PT. Golden Sinar Sakti in Indonesia produces citric acid. All components are classified as Generally Recognized As Safe (GRAS)[20]. The tools used are wooden booths, plastic bottles, servings, trays, plastic spoon, pen, questionnaire.

Procedure

The QDA procedure carried out in this study broadly consists of three stages: panelist preparation stage, FGD, and quantitative descriptive test[21,22]. Bay leaf water extract using decocted method and guava juice using water extraction, procedure can be seen in the Image 1. The development of jelly drink formulas refers to early studies[23], with the addition of glucomannan (1 g/L of water; 0.1%) and stevia (0.75 g/L of water; 0.075%), citric acid was added until the pH level reached 4.6, at a concentration of 0.05%. The beverage was heated for a duration of 10 minutes at a temperature of 90°C.

QDA was carried out on four jelly drink product formulas, namely F0 (standard product made from guava juice with a ratio of guava: water = 1:2 and the addition of 0.075% stevia), F1 (jelly drink bay leaf water extract combination with guava juice with a ratio of 75:25), F2 (50:50), F3 (25:75), which can be seen in the Image 2. As many as eight trained panelists participated in the QDA test aged 20 – 35 years. Panelists were recruited based on experience conducting sensory tests and their interest, willingness, and accustoming to consuming herbal drinks or fruit juices. Panelists were trained, and products were evaluated using descriptive sensory analysis with the QDA method. The exclusion include smoker, pregnant and allergy, allergic to consuming herbs and fruits. The descriptive sensory test result data is presented in a standard radar graph.

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F0: Guava fruit juice (standard); F1: Jelly drink bay leaf water extract: guava juice (75:25); F2: Jelly drink bay leaf water extract: guava juice (50:50); F3: Jelly drink bay leaf water extract: guava juice (25:75)

Images 2. Four jelly drink product formulas

Panelist Preparation

The eight trained panelists involved in this study were qualified by having attended and graduated from sensory attribute analysis training and certificates of completion as proof. They come from various backgrounds, including undergraduate and graduate students and alums of the Department of Community Nutrition and laboratory and academic staff of the Department of Community Nutrition. The number of panelists involved reached a number that was in line with the recommendations of Kemp et al. (2018) for the QDA test, which was 6 to 18 people[21].

FGD

FGD is a group discussion session conducted in a small scope for 1-2 hours with a moderator, which aims to get responses from panelists to the sensory properties of jelly drinks to be measured[22]. Moderators and notulens are selected from the panelists to lead and direct the discussion process. The FGD began with the moderator delivering discussion topics related to the purpose of the research and a description of the product to be tested to equalize the panelists' perception of the product's sensory attributes in general. Next, the moderator guides each panelist to reveal the sensory properties of the formula and specific commercial products as much as possible. The sensory attributes assessed in this study consisted of 17 attributes. Reference to the sensory attributes of jelly drinks can be seen in Table 1.

QDA Test

100 ml of the product is presented in hermetically sealed plastic packaging bottles, randomly assigned a 3-digit numeric code, and stored at room temperature. In addition, drinking water, a container for spitting, tissues, and tongue cleaner (white bread) are also provided on a white plastic tray. Panelists are asked to fill in the sensory attribute column in the assessment sheet with all the attributes identified and agreed upon by the panelists in sensory evaluation Laboratory of the Nutrition Science Program, Department of Community Nutrition, IPB University, Bogor, Indonesia. Next, panelists assigned scores based on the intensity of sensory attributes according to their perception, using a rating scale from 1 (extremely weak) to 10 (extremely strong) based on [22] with modification. The QDA test results are then tested differently and entered into a spider web diagram. The profile of sensory attributes of the jelly drink is divided into three groups, namely, group 1 (sensory attributes of appearance and texture), group 2 (sensory attributes of aroma), and group 3 (sensory attributes of taste, mouthfeel, and aftertaste). The division is carried out to facilitate the reading of descriptive test results.

Table 1. Reference 17 sensory attributes of jelly drink the QDA stage

Attribute	Definition	Reference
Appearance		
Particle aggregation size	Physical dimensions of the particles in the jelly drink	Strong: diameter particle size 0.5 cm Weak: diameter particle size 0.05 cm
Viscosity	Visual aspects of jelly drink viscosity	Strong: 100% pure yoghurt Weak: 50% yoghurt + water solution
Homogeneity	Jelly drink stability against sedimentation and solution phase separation	Strong: 100% jelly drink particles fused Weak: 50% particle-particle jelly drink fused
Aroma		
Bayleaf	A fresh aroma, varying from mild to slightly spicy, with a touch of delicate woody aroma	Strong: 10 g bay leaf + 30 ml water solution Weak: 1 g bay leaf + 30 ml water solution
Guava fruit	Sweet, musky, and very aromatic	Strong: 50% guava – water solution Weak: 50% guava juice – water solution
Sweet	Sweet-smelling, like honey	Strong: Honey Weak: 10% Honey – water solution
Texture		

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Attribute	Definition	Reference
Gritty	Jelly drink has a sensation like sand or grains that are felt when touched	Strong:1% guava seeds – water solution Weak: 0.1% guava seeds – water solution
Ease of spreading	Jelly can spread or adhere to surfaces	Strong: 50% jelly drink – water solution Weak: 5% jelly drink – water solution
Taste		
Guava fruit	Jelly drink with a flavor similar to guava	Strong: guava puree Weak: 50% guava – water solution
Sweet	Jelly drinks have a sweet taste similar to sugar	Strong: 16% sucrose – water solution Weak: 1.61% sucrose – water solution
Sour	Jelly drink with a sour flavor	Strong: 0.2% citric acid – water solution Weak: 0.02% citric acid – water solution
Bayleaf	Jelly drink with a flavor similar to bay leaves	Strong: 10 g bay leaf + 30 ml water solution Weak: 1 g bay leaf + 30 ml water solution
Mouthfeel		
Gritty	A Jelly drink has a sensation like sand or granules felt in the mouth when chewed	Strong:1% guava seeds – water solution Weak: 0.1% guava seeds – water solution
Jelly-like consistency	A sensation or texture that is soft and provides a distinctive gel-like structure	Strong: 10% jelly – water solution Weak: 1% jelly – water solution
Viscosity	A thick sensation or texture felt in the mouth	Strong: 100% plain yoghurt Weak: 50% yoghurt + water solution
Aftertaste		
Astringent	Astringent taste in the mouth that is left behind after consuming a jelly drink	Strong: tea bags soaked for 90 minutes Weak: tea bags soaked for 9 minutes
Bitter	The bitter sensation that emerges after consuming a jelly drink	Strong: 0.018% caffeine – water solution Weak: 0.18% caffeine – water solution

Data Analyzes

Analysis of organoleptic data on QDA using variety test (ANOVA). If there is a real effect between the three treatments and comparisons studied, the test is continued using Duncan's Multiple Range Test. The results of the descriptive data recapitulation were processed using the 2019 version of XLSTAT with the Principal Component Analysis (PCA) method VAT Number: FR70429102767, French.

RESULTS AND DISCUSSIONS

QDA is a sensory analysis method included in the descriptive test[22]. The principle of QDA is that trained panelists evaluate products with a scale on agreed sensory attributes, and then the QDA results are analyzed statistically. The advantage of this method is that the results of the product description will be more specific and in accordance with the product's characteristics because the panelists contribute to the selection of sensory attributes and the product rating scale. The average rating of appearance, aroma, texture, taste, mouthfeel, and aftertaste of jelly drinks can be seen in Table 2.

Table 2. Average rating attributes of appearance, aroma, texture, taste, mouthfeel, and aftertaste of jelly drink

Attributes of Jelly Drink	Average Rating				p-values
	F0	F1	F2	F3	
Appearance					
Particle aggregation size	0.50 ± 0.53a	3.62 ± 0.92c	2.62 ± 0.74b	2.0 ± 0.92b	0.0000*
Viscosity	5.25 ± 0.46c	1.50 ± 1.06a	2.50 ± 1.31ab	3.37 ± 1.18b	0.0000*
Homogeneity	6.50 ± 0.53d	1.37 ± 0.92a	2.50 ± 1.06b	3.87 ± 1.24c	0.0000*
Aroma					
Bayleaf	0.00 ± 0.00a	8.00 ± 0.00d	6.00± 0.75c	3.25 ± 1.75b	0.0000*
Guava fruit	8.62 ± 0.51d	2.00 ± 1.51a	4.37 ± 1.18b	6.50 ± 0.92c	0.0000*
Sweet	2.62 ± 0.52 c	0.37 ± 0.74a	1.12 ± 0.64 ab	1.62 ± 1.06 ab	0.0000*
Texture					
Gritty	7.25 ± 0.46 d	1.87 ± 1.24c	2.75 ± 1.38a	4.25 ± 1.98a	0.0000*
Ease of spreading	2.12 ± 1.72a	7.37 ± 0.51d	5.25 ± 0.88c	3.87 ± 1.45b	0.0000*
Taste					
Guava fruit	7.62 ± 0.51d	2.00 ± 1.41a	3.87 ± 1.55b	5.87 ± 1.35c	0.0000*
Sweet	3.37 ± 0.51b	1.50 ± 0.92a	1.62 ± 0.74a	2.00 ± 0.53a	0.0000*
Sour	3.25 ± 0.70c	0.87 ± 0.83a	1.37 ± 1.06ab	2.12 ± 0.83b	0.0000*
Bayleaf	0.00 ± 0.00a	7.62 ± 0.51c	5.37 ± 1.18b	4.00 ± 1.41a	0.0000*
Mouthfeel					
Gritty	4.12 ± 0.35c	0.75 ± 0.88a	1.50 ± 0.75a	2.37 ± 1.06b	0.0000*
jelly-like consistency	0.37 ± 1.06a	2.12 ± 1.80b	2.87± 1.24bc	4.12 ± 0.99b	0.0000*

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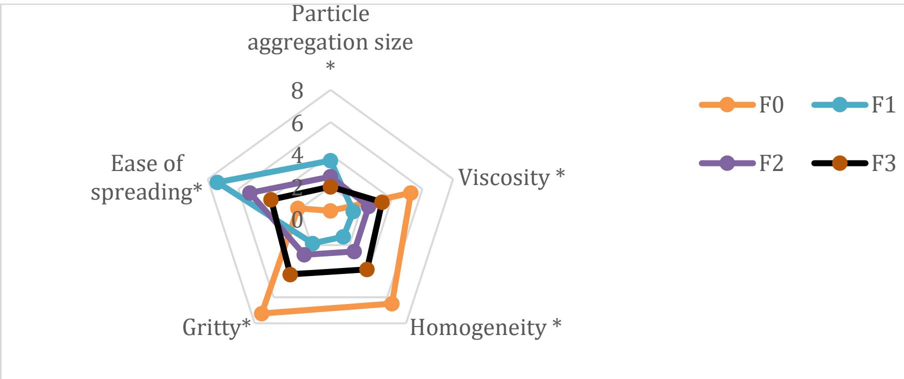
Attributes of Jelly Drink	Average Rating				p-values
	F0	F1	F2	F3	
Viscosity	2.50 ± 0.53c	0.25 ± 0.46a	0.87 ± 0.64b	1.37 ± 0.51b	0.0000*
Aftertaste					
Astringent	2.62 ± 0.51c	0.50 ± 0.53a	0.87 ± 0.83ab	1.50 ± 0.75b	0.0000*
Bitter	0.37 ± 0.51a	0.12 ± 0.35a	0.37 ± 0.51a	1.12 ± 0.64b	0.004*

* The one-way ANOVA test results indicate a significant difference (p<0.05). 'ns' indicates no significant difference.

The sensory attribute variation test results that can be compared between the formula and control products show that 17 sensory attributes are significantly different (p<0.05). The sensory attribute profile of appearance and texture (group 1) of the jelly drink formula can be seen in Images 3. In Images 3, it is shown that sensory attributes related to appearance (aggregation size, viscosity, homogeneity) and texture (gritty and spreadability) are among the sensory attributes that can be compared between formulas. F0 exhibits significantly smaller aggregation size compared to F1, F2, and F3, as indicated by the DMRT test. This result is due to F0 being a guava fruit juice product without adding bay leaf water extract and glucomannan.



n*: The one-way ANOVA test results indicate a significant difference (p<0.05); F0: Guava fruit juice (standard); F1: Jelly drink bay leaf water extract: guava juice (75:25); F2: Jelly drink bay leaf water extract: guava juice (50:50); F3: Jelly drink bay leaf water extract: guava juice (25:75)

Images 3. Sensory attribute profile of appearance and texture of jelly drink in all formulas

The standard viscosity intensity value is more excellent than the other three formulas. The ratio of bay leaf water extract to guava juice affects the appearance attribute and viscosity of mouthfeel in the study, as evidenced by the significantly different results of the one-way ANOVA test (p<0.05). The standard product (F0) uses a guava fruit: water addition ratio of 2:1. At the same time, F1, F2, and F3 are treated with the addition of bay leaf water extract, resulting in F0 having higher viscosity than the other formulas. The increase in viscosity is caused by pectinase's breakdown of pectin and other cell wall components of guava. Pectin, as a binder, is capable of enhancing viscosity[24]. Adding 0.1% glucomannan to F1, F2, and F3 does not affect the viscosity level of the jelly drink. The standard product has the best homogeneity compared to all formulas because there are hardly any visible deposits and layers on the surface. This is consistent with the viscosity appearance of the jelly drink products among the formulas, where pectin affects the homogeneity of the beverage.

Referring to the physical properties of the main ingredient used to make a jelly drink, guava fruit, when guava seeds are processed in crushing, they tend to become a smooth or granular texture that gives a gritty sensation. The gritty texture and mouthfeel in the standard formula are higher than the other three. The ratio of adding guava juice affects these attributes, as evidenced by significantly different results of the one-way ANOVA test (p<0.05). The spreadability intensity value of F1 is greater than the other three formulas. The ratio of bay leaf water extract to guava juice affects the spreadability of the jelly drink, as evidenced by significantly different results of the one-way ANOVA test (p<0.05). Factors affecting the spreadability of jelly include viscosity, consistency, and texture of the jelly drink[25]. Jelly drinks with good viscosity and consistency tend to spread more quickly than those that are too thick. A smooth texture and not overly sticky jelly drink can enhance its spreadability. Images 4 shows that there are three sensory attributes related to aroma that are included in the sensory attributes that can be compared between formulas and standard products, namely bay leaf aroma, guava aroma, and sweet aroma. Bay leaf aroma is produced by volatile compounds such as alkaloids, flavonoids, saponins, tannins, steroids, terpenoids, essential oils (0.05%), citral, and eugenol[26,27,28].

In bay leaf, compounds such as eugenol (11%-12%), methyl eugenol (9%-12%), and elemicin (1%-12%) are significant for the spicy aroma of bay leaves. Formula 1 has a higher value compared to other formulas. The ratio of bay leaf water extract affects the bay leaf aroma in the jelly drink, as evidenced by significantly different results of the one-way ANOVA test (p<0.05). The higher the percentage of bay leaf water extract, the stronger the bay leaf aroma in the jelly drink. Boiling can enhance the aromatic compounds of bay leaves and reduce the anti-nutrient content[29]. The intensity value of guava aroma in

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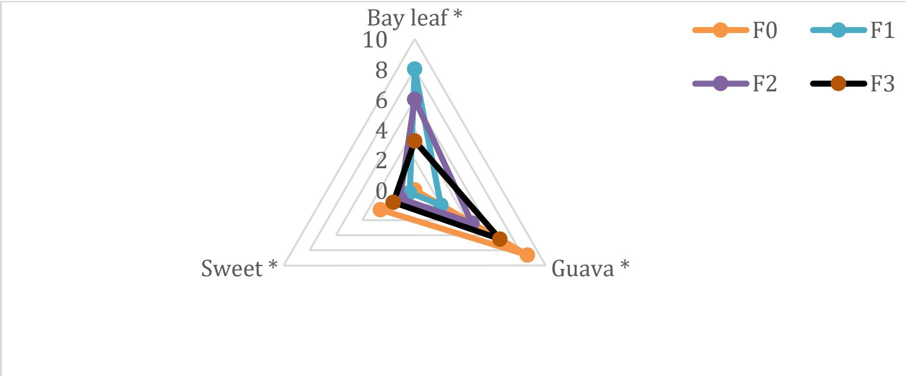
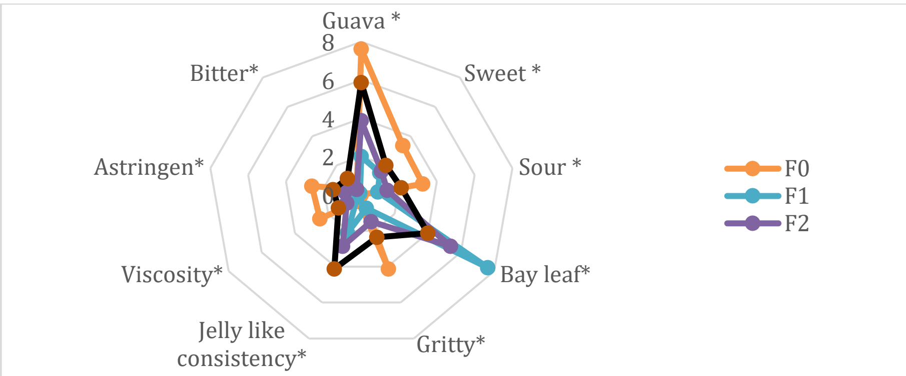
the standard (F0) is more significant than in the other three formulas. The ratio of guava juice affects the guava aroma in the jelly drink. Aromatic compounds that influence the guava aroma include terpenoid hydrocarbons and 3-hydroxy-2-butanone, as well as some sulfur-containing components like 3-mercaptohexanol and 3-mercaptohexyl acetate[30]. The ratio of guava affects the sweet aroma in the jelly drink, as evidenced by significantly different results of the one-way ANOVA test ($p<0.05$). Guava (*Psidium guajava L.*) is a tropical fruit with a sweet aroma[31]. The active component that emits a sweet aroma in bay leaves is linalool (33.3%)[32]. However, the panelists did not detect a sweet aroma in jelly drink F1, which is suspected to be because guava fruit's sweet aroma is stronger than bay leaf water extract.



n*: The one-way ANOVA test results indicate a significant difference ($p<0.05$); F0: Guava fruit juice (standard); F1: Jelly drink bay leaf water extract: guava juice (75:25); F2: Jelly drink bay leaf water extract: guava juice (50:50); F3: Jelly drink bay leaf water extract: guava juice (25:75)

Images 1. Sensory attribute profile aroma of jelly drink in all formulas

The sensory attribute profile of taste, mouthfeel, and aftertaste (group 3) of the jelly drink formula can be seen in Images 5. The intensity value of guava flavor in the standard (F0) is more significant than in the other three formulas. A total of 83 taste compounds have been identified in guava fruit, including 15 aldehydes, 15 alcohols, 11 esters, 32 terpenes, five ketones, and five other compounds[24]; several factors influence the characteristic taste of guava in the jelly drink. The sweetness of the jelly drink is affected by the addition of stevia, which is added at a concentration of 0.075%. Extract from stevia leaves contains steviol glycoside compounds that provide significant calorie-free sweetness[33]. The intensity value of sweetness in the standard (F0) is more significant than in the other three formulas. When ripe, guava becomes very soft and sweet. The main component that gives sweetness to guava is sugar, especially fructose and glucose[34]. the intensity value of sourness in the standard (F0) is more significant than in the other three formulas. The sour taste in the jelly drink is influenced by guava juice, where guava contains organic acids such as citric acid and malic acid that give a refreshing sour taste[35]. The intensity value of jelly mouthfeel in the standard (F0) is the smallest compared to the other three formulas. This is because the standard formula is not supplemented with glucomannan, while the other formulas are supplemented with 0.1%. Glucomannan functions to increase gel viscosity[36]. Thus, causing a jelly-like mouthfeel.



n*: The one-way ANOVA test results indicate a significant difference ($p<0.05$); F0: Guava fruit juice (standard); F1: Jelly drink bay leaf water extract: guava juice (75:25); F2: Jelly drink bay leaf water extract: guava juice (50:50); F3: Jelly drink bay leaf water extract: guava juice (25:75)

Images 2. Sensory attribute profile of taste, mouthfeel, and aftertaste of jelly drink in all formulas

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The pectin content in guava affects the jelly-like mouthfeel in the research product[37], as pectin production can enhance gel-forming properties[38]. The gritty mouthfeel is caused by coarse particles or grains that are insoluble in the product. The intensity value of astringent aftertaste in the standard (F0) is the highest compared to the other three formulas. With incidents reported in many fruits, vegetables, herbs, cereals, legumes, spices, and herbs, they are the primary sources of astringentcy in foods and beverages[39]. The astringentcy of guava fruit is due to the arabinose ester of hexahydrodiphenic acid[40]. The intensity value of bitter aftertaste in the standard (F3) is the highest compared to the other three formulas. Guava fruit skin has a high antioxidant capacity, including carotenoids, anthocyanins, flavonoids, and phenolic acids[41].

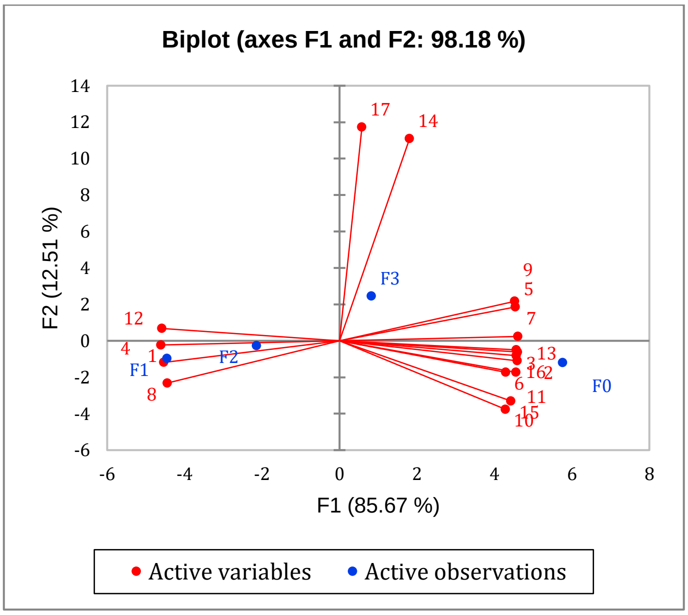
Sensory Profiling using Principal Component Analysis (PCA)

Sensory profiling using PCA allows for analyzing and interpreting complex sensory data more efficiently and in-depth, enabling a better understanding of the analysis results[42]. The results differ from the data used for visualizing the differences when using PCA for the average data in the yogurt dataset with 8 samples and 21 attributes, showing 20 significant attributes[43]. Based on Images 6, the model was resolved in two factors that explained 98.18% of the variance in the data. It can be observed that the same quadrants are present in variables F1 and F2, indicating that they are closely related in terms of characteristics and attributes, such as bay leaf aroma, aggregation size appearance, and spreadability level. Meanwhile, F3 tends to approach and relate to a bitter aftertaste, jelly-like mouthfeel, guava flavor and aroma, and gritty texture. The standard product (F0) exhibits sweetness, sourness, sweet aroma, homogeneous appearance, thick and gritty mouthfeel, and astringent aftertaste.

The Determination of the Chosen Formula

Profiling sensory of a food product is essential in determining the product's favorability and acceptability among customers[44]. Based on QDA testing, there were deficiencies found in formulas one and three that not accepted by consumers because there are weaknesses, such as very non-homogeneous appearance and strong bay leaf aroma, which scored highest in formula 1, while formula 3 had the highest scores in astringent and bitter aftertaste as well as gritty texture and mouthfeel. This would be the reason for less favorable consumer acceptance. It is concluded that the chosen treatment is jelly drink formula 2 with a ratio of bay leaf extract and guava juice with ratio (50:50).

This study has several strengths. First, QDA uses trained panelists to provide quantitative assessments of sensory attributes, thereby reducing subjectivity and increasing consistency of results. Second, it provides detailed and specific descriptions of attributes. Third, the results of QDA are presented in quantitative data form, which can be statistically analyzed to identify significant differences or trends. However, there are limitations. Training panelists and conducting QDA sessions require considerable costs and the training process for panelists to achieve the desired level of consistency and accuracy takes a significant amount of time.



1: Particle aggregation size; 2: Viscosity; 3: Homogeneity; 4: Aroma of bay leaf; 5: The aroma of guava fruit; 6: Aroma of sweet; 7: Texture of gritty; 8: Ease of spreading; 9: Taste of guava fruit; 10: Taste of sweet; 11: Taste of Acid; 12: Taste bay leaf; 13: Mouthfeel gritty; 14: jelly-like consistency; 15: Viscosity; 16: Astringent; 17: Bitter; F0: Guava fruit juice (standard); F1: Jelly drink bay leaf water extract: guava juice (75:25); F2: Jelly drink bay leaf water extract: guava juice (50:50); F3: Jelly drink bay leaf water extract: guava juice (25:75)

Images 3. PCA biplot of factor 1 (85.67% variance) versus factor 2 (12.51% variance)

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CONCLUSIONS

Training panelists using FGD method QDA resulted in several sensory attributes consisting of 17 attributes: appearance (particle aggregation size, viscosity, homogeneity), aroma (bay leaf, guava, sweetness), texture (gritty, spreadability), taste (guava, sweetness, sourness, bay leaf), mouthfeel (gritty, jelly-like, viscosity), aftertaste (astringent and bitter). There were deficiencies found in formulas one and three that could affect consumer preference, such as very non-homogeneous appearance and strong bay leaf aroma, which scored highest in formula 1, while formula 3 had the highest scores in astringent and bitter aftertaste as well as gritty texture and mouthfeel. It is concluded that the chosen treatment is jelly drink formula 2 with a ratio of bay leaf extract to guava juice = 50:50. Descriptions like this will help food technology in developing new products. In future study, it is essential to assess components like organic acids and volatile aroma compounds, in addition to evaluating sensory profiling.

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AUTHOR CONTRIBUTIONS

SP: executing and collecting the study, writing original draft; SAM: shaping the research concept, monitoring their condition throughout the study; BS, RR: determining technical research methods, monitoring their condition throughout the study; AEY: editor manuscript; AR: analyzing data in research parameters.

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