

## **Consumer Preferences of Functional Powdered Drink based on Palm Sugar**

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*Abstract:* - Other than as a sweetener, palm sugar block has been known for its health benefits, especially to increase stamina. In this study, functional powdered drinks had been developed using palm sugar with the addition of spices (lemongrass, cinnamon, cloves, white ginger, and red ginger). This study aimed to analyze consumer preferences for these functional drinks based on respondent social characteristics as well as the properties of the products, such as aroma, taste, color, and texture. The results of the study show that in general

male consumers preferred the products more than female consumers. Younger respondents (<35 years old), who were university students and young lecturers, had the first preference for the product with a clove flavor and then on the cinnamon flavor. On the other hand, respondents who worked at a job that requires high stamina preferred the palm sugar functional powdered drink with the addition of red ginger. Most of the respondents agreed to give the score of 4 (like) to the attributes of aroma, taste, and color of the products and score of 3 (slightly like) towards texture attribute, except for the drink product with the addition of cinnamon spices.

*Keywords:* attributes, consumers, drinks, preference, powdered palm sugar, social characteristics

## 1. Introduction

In one hand, consumer preferences for instant and ready-to-eat products are increasing. The practical nature of these products attracts modern society as the intensity of people's activities increasing. On the other hand, more people demand healthy food and beverages to meet their energy and nutrition requirement [1], [2]. These conditions can be an opportunity to create and develop functional beverage products.

One of the food ingredients that is potential for a functional drink is palm sugar. In Indonesia, the local communities have long realized that palm sugar has many health benefits, especially to increase stamina. People often use palm sugar as a sweetener in food and beverages or directly consumed to improve vitality. [3] stated that palm sugar is organic, high in nutrition, and low calory.

In this study, palm sugar was processed to produce a functional drink with the addition of several spices: lemongrass, cinnamon, cloves, white ginger, and red ginger. [4] stated that the addition of spices to powdered palm sugar drinks was intended to increase the benefits of drinks for consumers' health. These five spices were chosen because of their health benefits and because they often been used as herbal medicine and to increase stamina. Some of the benefits of these herbs are:

- Lemongrass (*Cymbopogon nardus L. Rendle*) contains essential oils, alkaloids, flavonoids, and polyphenols that have anti-depressant, anti-inflammatory, anti-bacterial, and anti-cancer properties [5], [6].
- Cinnamon (*Cinnamomum burmanii*) contains cinnamaldehyde, eugenol, cinnamic acid, catechins, epicatechin, and other polyphenols. These compounds make cinnamon a potential source of antioxidant and anti-hyperglycemic [7], [8], [9].
- [10] states that the use of cloves in the industry is mainly because they have a unique aroma. The aroma comes from essential oils which are present in relatively large quantities (10-20% in

flowers, 5-10% in stems, and 1-4% in leaves). [11] also revealed the advantages of clove nutrition and its potential as a source of essential oils, fat (fixed oil), resin, tannin, cellulose, protein, and pentosan.

- The results of the study by [12] showed that active non-volatile phenol compounds such as gingerol, shogaol, and zingerone in ginger are proved to have antioxidant properties. Furthermore, [13] stated that gingerol and shogaol are able to act as primary antioxidants against lipid radicals
- Ginger (*Zingiber officinale*) contains gingerol, zingerone, flavonoids, and essential oils that have benefits of protecting stomachs, anti-ulcerogenic, and antioxidant [14], [15].

The many benefits of palm sugar powder functional beverage with spices flavored variants do not guarantee the success of this product on the market. This is because many beverage products with various advantages are competing in the market. Therefore, the study of consumer perceptions and preferences for this product is essential to develop it to be accepted by the market.

Consumer preferences are often influenced by their social characteristics, such as age, gender, type of work, and education. This is in accordance with [16] statement that consumer behavior is influenced by cultural, social, personal, and psychological factors.

The consumer perceptions and preferences are based on aroma, taste, texture, and color. [17] states that the attributes of aroma, taste, texture, and color are related to consumer preferences. The evaluation of consumer preferences is needed to improve the quality of the product to increase satisfaction and buying interest ([18], [19], [20]). The attributes of a product can influence preferences based on preconceived perceptions in consumers.

This study aimed to (a) analyze how consumer preferences for palm sugar powder functional beverage with five available variants (lemongrass, cinnamon, clove, white ginger, red ginger) based on

consideration of social characteristics, and (b) analyze how consumer preference of each variant of the product based on the assessment of the attributes of aroma, taste, color, and texture.

## 2. Problem Formulation

Data collection was carried out by survey method to 100 people (respondents). The accidental sampling method was used in this study. Data were analyzed with the descriptive statistics method.

The respondents were given testers of palm sugar powder functional beverage with five flavors, namely lemongrass, cinnamon, clove, white ginger, and red ginger. In each variant, there were three levels of concentration, i.e. 10%, 15%, and 20%. The respondents were also given the product without spice addition (original flavor).

Respondents selected 1 of the 5 flavor variants provided and then chose 1 of the 3 concentration for each flavor, including the sample with the original flavor. The respondents' perception and preferences were taken using a questionnaire.

## 3. Problem Solution

Each flavor of the palm sugar powder functional beverage (lemongrass, cinnamon, clove, white ginger, and red ginger) has specific health benefits. However, consumer preferences are essential to develop the functional beverage further.

The addition of five different types of spices (lemongrass, cinnamon, clove, white ginger, and red ginger) in the product gave a different preference among respondents, as shown in Table 1.

Table 1. Consumer Preference of the Product

Flavor	Number of respondents	Percentage (%)
Lemongrass	9	9
Cinnamon	20	20
Clove	14	14
White ginger	20	20
Red ginger	36	36
		<b>100</b>

Table 1 shows that the majority of consumers (36%) preferred for the palm sugar powder functional drink with the red ginger flavor as consumers have known the health benefits of red ginger compared to other spices. Another thing that caused high consumer preference for the red ginger variant was that the beverage products with added

ingredients of red ginger are rare in the region; thus, the respondents were curious to try it. However, the drink with lemongrass additives is also rare but it had the lowest consumer interest (9%) compared to other flavor variants. This can be explained by the fact that the respondents were not familiar with the use of lemongrass as a mixture of drinks. The respondents were more familiar with using lemongrass as a seasoning. The same reason could also explain the low preference for palm sugar powder functional drinks with clove flavor.

As can be seen in Table 1, there was the same percentage of preference for cinnamon and white ginger variants. However, this similarity was motivated by different reasons. The respondents who chose the white ginger flavor explained that they are familiar with the pleasant taste and aroma of white ginger spices. Meanwhile, respondents who chose the cinnamon flavor said that they want to try a new taste and aroma in a beverage that was the cinnamon. The respondents explained that their preference for a spice flavor variant was influenced by their previous habit of consuming spices and the spice taste.

### 3.1 Consumers Preference for Palm Sugar Powder Functional Beverage with Five Flavors based on Their Social Characteristic

Consumers' preferences are related to their social characteristics, such as age, gender, type of work, and education [16]. Consumers preference for palm sugar powder functional drinks with five flavors based on their social characteristics is displayed in Table 2.

Table 2. Consumers preference for palm sugar powder functional drinks with five flavors based on their social characteristics

Flavor	Age Average (Years)	Gender Average (M, F)	Education Average	Occupation Average
Lemongrass	38	M	Master	Lecturer
Cinnamon	33	M	Master	Lecturer
Clove	23	F	Senior High School	University students
White Ginger	37	M	Master	Civil servant
Red Ginger	40	M	Bachelor	Security guard

Table 2 shows that most of the respondents were male. This can be explained that male consumers were more willing to try a new product than women.

Table 2 also shows differences in preferences for consumers of different ages. This is in accordance with the results of [21] that consumer age affects consumer behavior. The lowest age average was seen in respondents who had a preference for the product with clove and cinnamon flavored variants. The young respondents, in general, were young students and lecturers. The results can be explained that as clove and cinnamon have not yet been found as an additive in the market, respondents with a younger age were curious to try a new product. They feel proud of that courage.

Meanwhile, the highest age average was seen in respondents who had a preference for the product with red ginger flavor variants. These respondents had a tendency to choose a beverage product that had added health value. Red ginger is believed to have very good health benefits. Furthermore, more of the respondents who favored the red ginger flavored product worked as security guards, who need high stamina to do their job.

### 3.2 Consumer Preference for Palm Sugar Powder Functional Beverage with Five Flavors Based on the Assessment of Aroma, Flavor, Color, and Texture

There were three levels of spice concentration in each flavor variant of the product, namely the concentration levels of 10%, 15%, and 20%, except for the taste of cinnamon and clove. The cinnamon and clove have a very strong aroma and taste so that they can reduce consumer preference if the spice concentration was increased.

Preference for a variant with a certain concentration can be indicated by the frequency of choice. The more often a product was chosen by consumers, the more favored the product. The frequency of choice for the control and each flavor variant of the product at three levels of concentration are shown in Table 3.

Table 3. The frequency of choice of each variant of palm sugar powder functional drinks in three concentration levels

Flavor	Frequency of choice (times)	Percentage (%)
<b>Lemongrass</b>		
Control	2	11%
S1 (10%)	5	26%
S2 (15%)	7	37%
S3 (20%)	5	26%
Total	19	100%

<b>Cinnamon</b>		
Control	7	13%
K1 (10%)	24	44%
K2 (15%)	23	43%
K3 (20%)		
Total	54	100%
<b>Clove</b>		
Control	5	13%
C1 (10%)	17	43%
C2 (15%)	18	45%
C3 (20%)		
Total	40	100%
<b>White ginger</b>		
Control	1	4%
P1 (10%)	9	32%
P2 (15%)	9	32%
P3 (20%)	9	32%
Total	28	100%
Flavor	Frequency of choice (times)	Percentage (%)
<b>Red ginger</b>		
Control	5	11%
M1 (10%)	14	30%
M2 (15%)	13	28%
M3 (20%)	14	30%
Total	46	100%

Table 3 shows the frequency variations of consumer choice at each concentration level of each type of flavor variant and the comparison with the control (original flavor). As can be seen in Table 3, the respondents' preference for the control was very low compared to other flavors. Even though the original flavor of the palm sugar powder drink was a new product that had not yet been found in the market at the research site, the respondents were not motivated to try the original flavor. They preferred to drink the palm sugar powder drinks with the addition of spices.

Respondents had different preferences for concentration levels in each flavor variant (Table 3), except for the white ginger flavor variant. The highest preference of respondents to the moderate concentration level of spices (15%) was found in the lemongrass and clove flavor variants. Meanwhile, the highest preference for the low concentration level of spices (10%) was found in the cinnamon variant. The high category concentration level was

less favored by respondents in all flavors. There was the same preference for the low and high concentration levels in the lemongrass and red ginger flavor variants.

Table 3 shows that among the 9% of respondents who had a preference for the lemongrass variant, the highest frequency of choice (37%) was for the product with the medium concentration (15%) of lemongrass. This means that respondents preferred the product with the warm sensation of the medium category. The respondents were in a healthy body condition. They said that they would more prefer the product with the high concentration (20%) of lemongrass if they feel unwell. They believed that the sensation of warmth of lemongrass in the high concentration will help them to sweat and refresh their body.

Furthermore, Table 3 shows that there were only two types of cinnamon and clove concentrations product, i.e. 10% and 15% concentration. This was due to the very sharp aroma and taste of cinnamon and clove so that they could eliminate the distinctive taste of palm sugar in the higher concentration. Among the 20% of respondents who preferred the cinnamon and flavor variant, there were slightly more respondents who favored the low concentration (10%) than the medium one (15%). The respondents explained that they never tried drinks with the addition of cinnamon; thus, they wanted to choose the product with the cinnamon flavor. Meanwhile, there was a slight difference between the product with low and medium clove concentration. The respondents explained that they believed the clove has very good health benefits.

There was an interesting note from Table 3 that among the 20% of respondents who chose the white ginger flavor variant, there was an identical percentage of frequency of choice for all concentration. This could be caused by the fact that drinks with the taste and aroma of ginger are very familiar in the daily lives of respondents. The white ginger concentration level did not affect the respondents' preference.

Table 3 further informed that among 36% of respondents who had a preference for the red ginger flavor variant, the frequency of choice for all red ginger concentration was similar. This was the first time the respondents tasted red ginger-flavored drinks; thus, some respondents were more interested in trying the lowest concentration level first, and others were challenged to try the highest concentration level.

Respondents' preference for the products for various concentration levels was determined by their perception of the attributes of aroma, taste, texture,

and color. The four observed attributes then used to determine the average preference level in each flavor variant. The results are shown in Tables 4 – 8.

Generally, respondents liked (category 4 preference level) the aroma, taste, and color of the lemongrass-flavored product (Table 4). The average respondent perceived that the sharp aroma of lemongrass could be improved but they still liked the aroma. The respondents also explained that the sweet taste of palm sugar was too prominent so that the taste of the lemongrass was less pronounced but they still liked the sensation of lemongrass in the product. The texture was not liked by the respondents as they preferred a thicker texture (more lemongrass addition). The dark brown color of the product was liked by the respondents as they believed that the dark brown color could be associated with a sweet taste of a drink.

Table 4. Consumer perception and preference of the lemongrass-flavored product

Concentration	Perception and preference			
	Aroma		Taste	
	Perception	Preference	Perception	Preference
Control	3	4	5	4
S1 (10%)	4	4	4	4
S2 (15%)	3	4	3	4
S3 (20%)	4	4	4	4
Average	4	4	4	4
Concentration	Perception and preference			
	Texture		Color	
	Perception	Preference	Perception	Preference
Control	2	4	5	3
S1 (10%)	1	3	4	4
S2 (15%)	2	4	3	4
S3 (20%)	2	3	4	4
Average	2	3	4	4

Table 5. Consumer perception and preference of the cinnamon-flavored product

Concentration	Perception and preference			
	Aroma		Taste	
	Perception	Preference	Perception	Preference
Control	3	4	3	4
K1 (10%)	4	4	4	4
K2 (15%)	4	4	4	3
K3 (20%)	-	-	-	-

Average	4	4	4	4
Concentration	Perception and preference			
	Texture		Color	
	Perception	Preference	Perception	Preference
Control	3	4	4	4
K1 (10%)	3	4	3	4
K2 (15%)	3	4	3	4
K3 (20%)	-	-	-	-
Average	3	4	3	4

Table 5 shows that the average respondent liked (category 4 preference level) all attributes (aroma, taste, texture, color) of the cinnamon-flavored product. On average, the respondents liked the cinnamon aroma, the pronounced typical sweet taste of palm sugar, the slightly thicker texture, and the slightly dark brown color.

Table 6. Consumer perception and preference of the clove-flavored product

Concentration	Perception and preference			
	Aroma		Taste	
	Perception	Preference	Perception	Preference
Control	1	4	4	4
C1 (10%)	4	3	4	3
C2 (15%)	4	3	4	3
C3 (20%)				
Average	4	4	4	4
Concentration	Perception and preference			
	Texture		Color	
	Perception	Preference	Perception	Preference
Control	2	4	4	4
C1 (10%)	3	3	4	3
C2 (15%)	3	3	4	3
C3 (20%)				
Average	2	3	4	4

In the clove-flavored product, the average respondents liked the prominent aroma of clove spices, the sweet taste, and the dark brown color (Table 6). However, the runny texture was disliked by the respondents.

Table 7. Consumer perception and preference of the white ginger-flavored product

Concentration	Perception and preference			
	Aroma		Taste	

Concentration	Perception and preference			
	Texture		Color	
	Perception	Preference	Perception	Preference
Control	2	4	1	4
P1 (10%)	3	4	4	4
P2 (15%)	3	4	3	3
P3 (20%)	3	4	3	4
Average	3	4	3	4
Concentration	Perception and preference			
	Texture		Color	
	Perception	Preference	Perception	Preference
Control	1	4	2	4
P1 (10%)	2	4	3	4
P2 (15%)	2	3	3	4
P3 (20%)	2	4	3	4
Average	2	4	3	4

As can be seen in Table 7, the attributes (aroma, taste, texture, color) of the white ginger-flavored product were favored by respondents, but in various perceptions. Respondents' perceptions of aroma, taste, and texture were in the category of '3'. The white-ginger aroma was less sharp aroma, the taste was less sweet, and the color was a light brown. Meanwhile, the texture was in the category '2' which was considered not thick enough. Thus, the viscosity needs to be increased to improve consumer preference for the white ginger-flavored product.

Table 8. Consumer perception and preference of the red ginger-flavored product

Concentration	Perception and preference			
	Aroma		Taste	
	Perception	Preference	Perception	Preference
Control	2	4	1	4
M1 (10%)	3	4	4	4
M2 (15%)	4	4	3	4
M3 (20%)	4	4	3	4
Average	4	4	3	4
Concentration	Perception and preference			
	Texture		Color	
	Perception	Preference	Perception	Preference
Control	1	4	2	4
M1 (10%)	2	4	3	4
M2 (15%)	2	3	3	3
M3 (20%)	3	4	3	4
Average	2	3	3	4

Table 8 shows the tendency of respondents' preferences to be the same as the preference for the white ginger variant. The four attributes of the red ginger-flavored product were favored by respondents but in various perceptions. Respondents' perceptions of aroma, taste, and texture were in the category of '3'. The red-ginger aroma was less sharp aroma, the taste was less sweet, and the color was a light brown. Meanwhile, the texture was in the category '2' which was considered not thick enough.

The similar perception and preference between the white and red ginger flavors were caused by the similar attributes for ginger spice connoisseurs. The distinctive aroma and taste of ginger formed perceptions among the connoisseurs of ginger. They prioritized their preference for aroma and taste compared to the color and texture of the drink.

The results show that the respondents' preference for the attributes of aroma, taste, and color were in category 4 (like) and the texture was in category 3 (slightly like), except for the cinnamon-flavored product. The processing of the palm sugar powder functional drinks still used a simple technology; thus, it could not produce a texture that was perfectly integrated with palm sugar.

#### 4. Conclusion

The conclusions of this study are as follows.

1. Most of the respondents (36%) preferred the palm sugar powder functional drinks with the red ginger flavor variant, while the lowest preference was obtained by the lemongrass-flavored variant. Meanwhile, the preference for the control (original taste) was very low compared to the spice-flavored product.
2. The highest consumer's preference for medium concentration level of spices (15%) was found in lemongrass and clove variants while the highest preference for low concentration level of spices (10%) was found in the cinnamon variant. The high concentration level of spice (20 %) was less preferred in all flavors.
3. Based on the social characteristics, male consumers preferred the functional drinks of palm sugar powder. Younger consumers (<35 years old), who were generally students and young lecturers, liked the product with clove and cinnamon flavors. Meanwhile, consumers who work in a job that requires high stamina preferred the product with red ginger flavor variants.
4. On average, the respondents' preference for the attributes of aroma, taste, and color were in category 4 (like) and the texture was in category 3 (slightly like), except for the cinnamon-flavored product.

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