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REGULAR ARTICLE

INFLUENCE OF SENSORY ATTRIBUTES ON CONSUMER PREFERENCES AND CONSUMER SATISFACTION OF SOME LEDRE VARIANTS IN BOJONEGORO DISTRICT

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ABSTRACT

Ledre is a typical Bojonegoro souvenir product made from rice flour, tapioca flour and plantain. Competition in the food industry is increasing and consumer preferences for sensory attributes are increasingly diverse, thus affecting consumer satisfaction. This research aims to analyze the influence of sensory attributes on consumer preferences and levels of satisfaction. The tests used in this research are the hedonic test, Importance-Performance Analysis, and Customer Satisfaction Index. Based on the survey, 3 brands of original variant of ledre, 2 brands of pumpkin variant of ledre, and 1 brand of green bean variant of ledre were determined to be the sample. The results showed that there were real differences in the color, taste and texture attributes, while there weren't real differences in the smell/aroma attributes. The best performance level for smell, taste and texture attributes is owned by the 391 and the best performance level for the color attribute is owned by the 457 sample. The level of consumer satisfaction with the overall Ledre sample is 73.16% and 391 is the sample with the highest level of satisfaction, 76.45%.

Keywords: Customer satisfaction, ledre, sensory attributes

INTRODUCTION

Ledre is a typical Bojonegoro District souvenir in the form of snacks which has been a hereditary business since the 1940s and has been designated as a *Warisan Budaya Tak Benda* (WBTB) of Bojonegoro District in 2021 by the Ministry of Education, Culture, Research and Technology of the Republic of Indonesia. Ledre has become a Bojonegoro icon, earning Bojonegoro the nickname Ledre City. Ledre is a roll-shaped snack with a length of about 20 cm and a diameter of 1.5 cm. Nowadays, there are many variants of banana ledre, such as original, pumpkin, chocolate, mung bean, durian, cheese, milk, strawberry, milk, and jackfruit.

As time goes by, the world of the culinary industry in Indonesia is growing rapidly so that competition between culinary products is increasing. According to the Ministry of Tourism and Creative Economy, the culinary business in Indonesia continues to experience significant growth. Data by the Central Bureau of Statistics (2023) shows that the PDB growth rate of food and beverage accommodation providers in 2023 increased by 13.38% from the previous year. The increasing competition, ledre MSME players need to evaluate consumer preferences so that the sustainability of the business can still survive and be able to compete with other MSME products. Consumer preferences are consumer actions that show a tendency towards a choice among several choices offered. One of the factors that can influence is sensory attributes. Sensory characteristics are one of the important parameters in consumer decision making in purchasing a food product (Munarko *et al.,* 2023).

Safitri and Triastuti (2022) added that product quality affects customer satisfaction. Tarwendah *et al*. (2017) added that through sensory testing, product quality that is able to meet consumer expectations can be known. In line with the study of Firdauzi *et al*. (2023) stated that using the Importance-Perfomance Analysis (IPA) and Customer Satisfaction Index (CSI) methods was able to analyse the level of consumer satisfaction and attributes that needed to be improved on product quality and service in Moro Tresno agro-industry. Expectations and performance of sensory attributes can be known with IPA analysis supported by CSI so that recommendations for improvements related to product quality and customer satisfaction levels are obtained. Based on these considerations, consumer preference analysis needs to be done so that ledre

products can survive in the current food industry competition. In addition, ledre business activists are expected to make the results of the analysis as an evaluation and recommendation to continue to make improvements and improvements to product quality. Therefore, this study aims to analyse consumer characteristics as well as the influence of sensory attributes on consumer preferences and satisfaction levels on several ledre variants in Bojonegoro District.

MATERIAL AND METHODS

Materials

The material used in this research is 6 ledre products that have been done simple random sampling in Bojonegoro District. The selected samples were 3 original variant products (391, 812, 128), 2 walnut variants (625, 457), and 1 green bean variant (307).

Panelist and Location Determination

The method of determining ledre samples using simple random sampling, determining the number of respondents using the slovin formula so that 100 respondents were obtained, the respondents used accidental sampling method. The research was conducted in 3 souvenir shops, namely Dadi Tresno, Moro Tresno, and Ny. Khusnul. The criteria for respondents were ledre consumers; aged ≥ 17 years; knew several ledre brands; had consumed ledre; and liked ledre.

Data Collection

Data collection techniques used surveys and observations by carrying out Central Located Test-based consumer tests to obtain performance and expectation levels related to the sensory attributes of the samples. The consumer test used a hedonic test that included colour, smell/aroma, taste and texture. The rating scale used is a Likert scale with a range of 1-5 (strongly dislike to strongly like).

Data Analysis

The data processing methods used include descriptive statistical analysis, validity and reliability tests, hedonic tests, and Importance-Performance Analysis and Customer Satisfaction Index analyses. Data processing using IBM SPSS Statistics 25.

RESULTS AND DISCUSSION

1. Respondent Characteristics

According to Table 1, the domicile of respondents was categorised into 2 groups, 64% from within Bojonegoro District and 36% from outside Bojonegoro District. The gender of the respondents is categorised into 2 groups, namely male by 46% and female by 54%. The age of respondents is categorised into 5 groups, with the 17-25 age group at 39% as the highest percentage of the age group. The respondents' education level is categorised into 6 groups, with the senior high school education group at 55% as the highest percentage of the education group. The respondents occupations are categorised into 6 groups, with private employees at 34% as the highest percentage of the occupation group.The respondents income level is categorised into 4 groups, with <Rp 1,000,000 as the highest income group percentage at 34%.

Table 1. Respondent Characteristics

Characteristics	Type	Quantity
Domicile	Within Bojonegoro District	64
	Outsid Bojonegoro District	36
Gender	Male	46
	Female	54
Age	17 – 25 years old	39
	26 – 34 years old	25
	35 – 43 years old	14
	44 – 51 years old	8
	52 – 60 years old	14
Education Level	Elementary School	2
	Junior High School	12
	Senior High School	55
	Diploma	8

Characteristics	Type	Quantity
	Undergraduate	19
	Postgraduate	4
Job Type	Civil Servants	10
	Private Employee	34
	Enterpreneur	8
	Student	21
	Housewife	8
	Other	19
Income Level	Less than Rp 1,000,000	34
	Rp 1,000,001 – Rp 2,500,000	31
	Rp 2,500,001 – Rp 5,000,000	24
	More than Rp 5,000,000	11

2. Validity Test Results

Based on the results of the validity test using the Pearson correlation technique, the r correlation value for each questionnaire item is shown in Table 2.

Table 2. Hedonic Validity Test Results

No.	Attribute/Product	Pearson Correlation	Min. r value	Description
1.	Color			
	391	0.314	0.3	Valid
	128	0.509	0.3	Valid
	457	0.594	0.3	Valid
	625	0.592	0.3	Valid
	812	0.550	0.3	Valid
	307	0.772	0.3	Valid
2.	Smell			
	391	0.606	0.3	Valid
	128	0.566	0.3	Valid
	457	0.644	0.3	Valid
	625	0.694	0.3	Valid
	812	0.637	0.3	Valid
	307	0.738	0.3	Valid
3.	Taste			
	391	0.480	0.3	Valid
	128	0.526	0.3	Valid
	457	0.499	0.3	Valid
	625	0.528	0.3	Valid
	812	0.582	0.3	Valid
	307	0.543	0.3	Valid
4.	Texture			
	391	0.699	0.3	Valid
	128	0.601	0.3	Valid
	457	0.595	0.3	Valid
	625	0.658	0.3	Valid
	812	0.722	0.3	Valid
	307	0.699	0.3	Valid

Table 3. Product Performance Validity Test Results

No.	Attribute/Product	Pearson Correlation	Min. r value	Description
1.	Colour			
	391	0.364	0.3	Valid
	128	0.508	0.3	Valid
	457	0.601	0.3	Valid
	625	0.579	0.3	Valid
	812	0.532	0.3	Valid
	307	0.738	0.3	Valid
2.	Smell			
	391	0.579	0.3	Valid
	128	0.584	0.3	Valid
	457	0.642	0.3	Valid

No.	Attribute/Product	Pearson Correlation	Min. r value	Description
	625	0.588	0.3	Valid
	812	0.633	0.3	Valid
	307	0.754	0.3	Valid
3.	Taste			
	391	0.502	0.3	Valid
	128	0.517	0.3	Valid
	457	0.515	0.3	Valid
	625	0.517	0.3	Valid
	812	0.593	0.3	Valid
	307	0.580	0.3	Valid
4.	Texture			
	391	0.660	0.3	Valid
	128	0.646	0.3	Valid
	457	0.624	0.3	Valid
	625	0.670	0.3	Valid
	812	0.750	0.3	Valid
	307	0.720	0.3	Valid

Table 4. Product Importance Validity Test Result

No.	Attribute/Product	Pearson Correlation	Min. r value	Description
1.	Color	0.696	0.3	Valid
2.	Smell	0.534	0.3	Valid
3.	Taste	0.368	0.3	Valid
4.	Texture	0.89	0.36	Valid

All questionnaire items have a Pearson correlation value greater than 0.3. This shows that the questionnaire used in this study is valid and able to measure the parameters to be studied. Each question item is considered valid if it has a corrected item total correlation validity value greater than 0.3 **(Sugiyono, 2013).**

3. Reliability Test Result

Based on the results of the validity test using the Pearson correlation technique, the r correlation value for each questionnaire item is shown in Table 5.

Table 5. Reliability Test Result

No.	**Item**	***Cronbach Alpha Score***	**meaning**
1.	Performance		
	Color	0.547	Low reliability
	Smell	0.692	Acceptable reliability
	Taste	0.504	Low reliability
	Texture	0.763	Acceptable reliability
2.	Kepentingan	0.252	Low reliability
3.	Hedonic		
	Color	0.536	Low reliability
	Smell	0.692	Acceptable reliability
	Taste	0.474	Low reliability
	Texture	0.741	Acceptable reliability

Through the reliability test, it is known that 6 items in the questionnaire used by researchers to measure each parameter have a Cronbach Alpha value of less than 0.6 so that it can be said that these items are not reliable and consistent in measuring parameters. The 4 items in the questionnaire used by researchers have a Cronbach Alpha value of more than 0.6 so that it can be said that these items are reliable and consistent in measuring parameters. This is also supported by the statement of Ghozali (2016) that the Cronbach Alpha coefficient value> 0.6 in the data, then the questionnaire is declared reliable.

4. Hedonic Test Result

Hedonic test is a form of organoleptic testing that aims to measure the level of panellists' liking for the product. The samples tested were 3 original variant samples (391, 128, 812), 2 walnut variant samples (457, 625), and 1 mung bean variant sample (307). Based on the normality test with Kolmogorov Smirnov, all samples in each attribute have 0.00 ($p < 0.05$) so they cannot be tested using ANOVA. The researcher used the Friedman test and Tukey's further test. Panelists' level of liking for colour, smell/aroma, taste, and texture parameters in all ledre samples is presented in Table 6**.**

Table 6. Panellists' level of liking for sensory attributes in all ledre samples

Sample	Colour	Smell	Taste	Texture
625	3.35±0.88[a]	3.48±0.90 [a]	3.37±0.95[a]	3.75±0.96 [a]
812	3.48±0.90[ab]	3.42±0.85 [a]	3.69±0.86[ab]	3.80±0.88 [a]
307	3.61±0.85[ab]	3.52±0.77 [a]	3.39±0.82[a]	3.83±0.85 [a]
391	3.66±0.79[ab]	3.68±0.84 [a]	3.85±0.87 [b]	4.05±0.81 [a]
128	3.70±0.90 [b]	3.55±0.88 [a]	3.69±0.94[ab]	3.75±0.90 [a]
457	3.80±0.85 [b]	3.50±0.82 [a]	3.84±0.88 [b]	4.00±0.88 [a]

Colour

Tarwendah (2017) states that colour acts as an attraction, identifier, and quality attribute in food products. A good initial impression can give a positive impression of other attributes. The test results showed that the colour of sample 625 was least preferred while sample 457 was most preferred. Samples 812, 307, and 391 had no significant effect with other samples, while sample 625 was significantly different from samples 128 and 457. Sample 457 has a bright yellow colour and there is a brownish colour. The addition of pumpkin in the manufacturing process can improve colour sensory. In line with the opinion of Aliya *et al.* (2024) that making jam with the addition of pumpkin can produce a brownish yellow colour. In addition, the brownish colour of ledre is caused by the maillard reaction during the manufacturing process. Yasinta and Nurwantoro (2017) stated that the colour will get darker due to the Maillard reaction. As for other factors that can cause product vacancy, the temperature and time used during processing are too high and long.

Smell/Aroma

Aroma attribute is the smell produced by a food product. The human body will respond to the odour given by a food product. Compounds that produce aroma in food products are volatile so that they will easily reach the olfactory system and need sufficient concentration to be able to interact with one or more existing olfactory receptors. The test results showed that the aroma of sample 812 was least favourable while sample 391 was most favourable. There was no significant difference between ledre samples. Ledre has a distinctive aroma of plantain as its role as the main ingredient. Probowati *et al.* (2023) stated that the use of selected raw materials and the right level of banana maturity in the process of making ledre will increase the distinctiveness of the aroma of ledre produced. Banana aroma is formed due to the presence of volatile compounds that will evaporate due to heat. In addition, the aroma of ledre is also influenced by the use of sugar in the processing process. Hamdi and Astuti's (2021) study stated that sugar will caramelise and affect the original aroma of banana. The heating process also affects the aroma formation process. In line with Hamdi and Astuti's (2021) study, too long a heating time will cause the original banana aroma to be lost due to degradation.

Taste

Taste is one of the attributes that has an important role in choosing a food product. Taste determines the quality of the food product offered. The test results showed that the taste of sample 625 was least preferred, while sample 391 was most preferred. Samples 625 and 307 were significantly different from samples 457 and 391, while samples 812 and 128 were not significantly different from all other samples. Through the Tukey test results, sample 391 is considered to be in accordance with consumer preferences for ledre flavour. Sample 391 has a sweet and savoury flavour derived from plantain and other ingredients. In one of the samples, 812, respondents felt a bitter after taste when tasting the sample. This was due to the burnt part of the sample. Probowati et al. (2023) stated that respondents wanted a sweet ledre flavour. The bitter after taste is caused by the sugar caramelisation process that takes too long to burn. Agustin *et al.* (2023) stated that flavour is formed by the combination of ingredients used in a food product. In samples 625 (pumpkin) and 307 (mung beans) had a low level of liking because the addition of pumpkin and mung beans was still not accepted on the respondents' tongue.

Texture

Texture is a combination of several physical properties that characterise a food product including size, shape, amount, and material forming elements that can be perceived by the senses of touch and taste. The test results showed that the texture of sample 625 was least favoured, while sample 391 was most favoured by respondents. There was no significant difference between all samples, but differences in favourability can be caused by various factors. Dwiani and Rahman's (2020) study stated that mixing formula factors, cooking conditions, and storage methods affect the texture of food products. The Tukey test showed that sample 391 best matched consumer preferences for ledre texture. In line with the opinion of Probowati *et al.* (2023) that ledre dough is made to be very thin so that it can produce a crunchy texture. The use of tapioca flour and rice flour also affects the texture of ledre. The addition of other ingredients such as waluh and mung beans can also affect the texture to be harder because these two commodities also contain amylose, amylopectin, and protein, especially in mung beans. Mung beans have a greater amylopectin content than amylose, at 58.56%,

which participates in increasing the ability to bind water due to the presence of hydroxyl groups (Agustin *et al.,* 2023).

5. Customer Satisfaction

Importance-Performance Analysis (IPA)

a. Level of Conformity

Based on the survey, the level of performance and importance for each attribute in each sample was obtained. The performance level is the result of the performance of an item or attribute that is assessed based on consumer satisfaction. The level of importance is the expectations or expectations of consumers of a product or service. The comparison between the performance level and the level of importance is the level of conformity of the attributes of a product or service.

Table 7. Calculation of Attribute Congruence and Priority Levels

No	Attribute	Performance Score	Importance Score	Level of Conformity	Priority Level
391					
1.	Taste	386	477	81%	1
2.	Smell	369	408	90%	2
3.	Texture	404	437	92%	3
4.	Colour	367	386	95%	4
128					
1.	Taste	365	477	77%	1
2.	Texture	375	437	86%	2
3.	Smell	354	408	87%	3
4.	Colour	369	386	96%	4
457					
1.	Taste	380	477	80%	1
2.	Smell	346	408	85%	2
3.	Texture	404	437	92%	3
4.	Colour	379	386	98%	4
625					
1.	Taste	336	477	70%	1
2.	Smell	350	408	86%	2
3.	Texture	377	437	86%	3
4.	Colour	339	386	88%	4
812					
1.	Taste	366	477	77%	1
2.	Smell	342	408	84%	2
3.	Texture	383	437	88%	3
4.	Colour	345	386	89%	4
307					
1.	Taste	341	477	71%	1
2.	Smell	351	408	86%	2
3.	Texture	383	437	88%	3
4.	Colour	369	386	93%	4

Based on the results of the calculation of the level of conformity, all attributes of ledre still do not reach 100% conformity so that they do not meet consumer expectations and satisfaction. Pranitasari and Sidqi (2021) state that attributes with a level of conformity <100% indicate that the quality of service provided is less / does not fulfil what consumers consider important. Table 7 shows that the colour attribute in sample 457 has the highest level of conformity compared to other samples, the aroma, taste and texture attributes in sample 391 have the highest level of conformity compared to other samples. The flavour attribute is the top priority product attribute to be improved in each ledre sample.

b. Importance-Performance Analysis Test Result

In analysing the attributes that require improvement in the level of performance against consumer expectations, it is necessary to carry out calculations related to each item and the results of the assessment are outlined in a cartesian diagram that is able to identify the advantages and disadvantages of each performance attribute and product sample expectations.

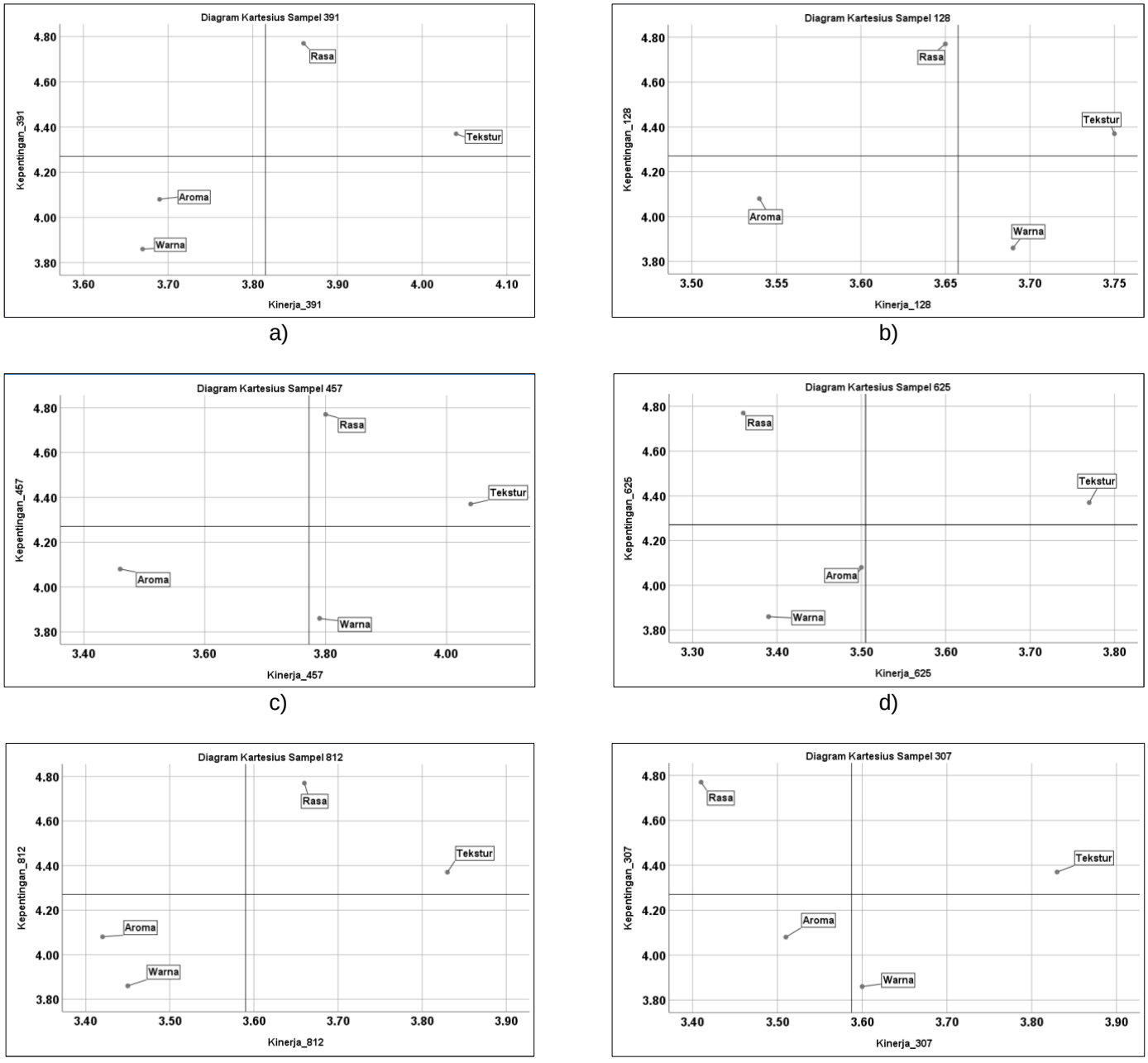

Figure 1. Importance-Performance Cartesian Diagram; a) 391, b) 128, c) 457, d) 625, e) 812, f) 307

Through the Cartesian diagram, sensory attributes that require improvement and improvement of attribute performance to increase the level of customer satisfaction can be known. Attributes that are in quadrant 1 (maintain performance) must continue to maintain their quality and performance, attributes that are in quadrant 2 (focus improve) are the top priority that must be improved, attributes that are in quadrant 3 (medium low priority) are the second priority that must be improved after quadrant 2, while attributes that are in quadrant 4 (reduce emphasis) do not need to be the focus of improvement because they already have performance that is considered good and appropriate but have low importance.

Based on Figure 1, Sample 391 requires improvement and improvement on colour and aroma attributes. Sample 128 requires improvements and upgrades to the flavour attribute as a priority, followed by the aroma attribute. Sample 457 requires improvements and enhancements to the aroma attribute. Sample 625 requires improvement and enhancement of taste attributes as a priority, followed by colour and aroma attributes. Sample 812 requires improvement and enhancement on aroma and colour attributes. Sample 307 requires improvement and enhancement to the flavour attribute as a priority, followed by the aroma attribute.

Customer Satisfaction Index (CSI)

The following are the results of the calculation of the Mean Importance Score (MIS), Weight Factor (WF), Mean Satisfaction Score (MSS), and Weight Score (WS).

Table 8. Calculation of Customer Satisfaction Index Calculation

No	Attribute	ΣY	MIS	WF	ΣX	MSS	WS
391							
1.	Colour	386	3.86	23%	367	3.67	0,829
2.	Smell	408	4.08	24%	369	3.69	0,881
3.	Taste	477	4.77	28%	386	3.86	1,078
4.	Texture	437	4.37	25%	404	4.04	1,034
	Total	1708	17.08	100%	1526	15.26	3,822
128							
1.	Colour	386	3.86	23%	369	3.69	0,83
2.	Smell	408	4.08	24%	354	3.54	0,85
3.	Taste	477	4.77	28%	365	3.65	1,02
4.	Texture	437	4.37	25%	375	3.75	0,96
	Total	1708	17.08	100%	1463	14.63	3,66
457							
1.	Colour	386	3.86	23%	379	3.79	0,86
2.	Smell	408	4.08	24%	346	3.46	0,82
3.	Taste	477	4.77	28%	380	3.8	1,06
4.	Texture	437	4.37	25%	404	4.04	1,03
	Total	1708	17.08	100%	1509	15.09	3,77
625							
1.	Colour	386	3.86	23%	339	3.39	0.76
2.	Smell	408	4.08	24%	350	3.5	0.84
3.	Taste	477	4.77	28%	336	3.36	0.94
4.	Texture	437	4.37	25%	377	3.77	0.96
	Total	1708	17.08	100%	1402	14.02	3.50
812							
1.	Colour	386	3.86	23%	345	3.45	0.78
2.	Smell	408	4.08	24%	342	3.42	0.81
3.	Taste	477	4.77	28%	366	3.66	1.02
4.	Texture	437	4.37	25%	383	3.83	0.98
	Total	1708	17.08	100%	1436	14.36	3.59
307							
1.	Colour	386	3.86	23%	360	3.6	0.81
2.	Smell	408	4.08	24%	351	3.51	0.84
3.	Taste	477	4.77	28%	341	3.41	0.95
4.	Texture	437	4.37	25%	383	3.83	0.98
	Total	1708	17.08	100%	1435	14.35	3.58
Overall							
1.	Colour	386	3.86	23%	360	3.6	0.81
2.	Smell	408	4.08	24%	352	3.52	0.84
3.	Taste	477	4.77	28%	362	3.62	1.01
4.	Texture	437	4.37	25%	388	3.88	0.99
	Total	1708	17.08	100%	1462	14.62	3.65

Through the calculations in Table 8 above, the customer satisfaction index can be determined through the following formula

$$CSI = (\Sigma WS / 5)x10f0\%$$

Table 9 below presents the value of the customer satisfaction index in each sample and the entire sample.

Table 9. Interpretation of CSI Values

Sample	Weight Value Total	CSI Value	Description
391	3.82	76.45%	Satisfy
128	3.66	73.20%	Satisfy
457	3.77	75.55%	Satisfy
625	3.50	70.10%	Satisfy
812	3.59	71.97%	Satisfy
307	3.58	71.68%	Satisfy
Overall	3.65	73.16%	Satisfy

Based on a study by Maqhfirah *et al.* (2023), the value of the consumer satisfaction index in all samples has satisfied criteria but there needs to be an increase in product performance to increase the level of consumer satisfaction with each ledre sample. The attributes that need to be improved are attributes that are in quadrant II and quadrant III positions on the Cartesian diagram of the Importance-Performance Analysis (IPA) analysis results.

CONCLUSION

Based on the research that has been conducted on the influence of sensory attributes on purchasing decisions and analysis of consumer satisfaction in several ledre variants, it can be concluded that the characteristics of consumers who mostly visit souvenir shops to buy ledre are from within Bojonegoro District, female, aged 17-25 years with the last education of Senior High School, working as private employees, and income level per month <Rp 1,000,000. There was a significant difference in the level of preference for colour, taste, and texture. Overall, ledre products have a satisfaction level of 73.16%. The highest level of consumer satisfaction is owned by sample 391, which is 76.45% with the statement that consumers are satisfied.

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