

A Gastronomical Value For Vegan And Vegetarian Consumers: Different Magnolia Experiments



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ABSTRACT

This study aims to test magnolia as a new gastronomic product suitable for vegan and vegetarian consumers' own diets. In this context, new recipes were created using plant-based milks in line with the sustainability and healthy living approach as an alternative to the traditional magnolia dessert containing animal milk. The study also aimed to evaluate the sensory properties of plant-based dessert alternatives and to examine how consumers perceive desserts made with plant-based milks. During the recipe preparation process, magnolia desserts were prepared using three different types of milk, namely cow's milk, almond milk and oat milk, and a sensory analysis test was applied to these products. 100 participants who have mastered the subject at the Department of Gastronomy and Culinary Arts, Sinop University evaluated these products in terms of sensory properties such as taste, smell, consistency and color. Participants were not informed about the types of milk in the recipes of magnolia desserts in advance, and the evaluations were made entirely based on personal perception. The basic findings obtained show that plant-based milks can be an alternative to traditional animal-based milk desserts in terms of sensory analysis. In particular, almond milk-based magnolia received positive feedback in terms of taste and consistency, while oat milk-based magnolia received lower appreciation rates in terms of color and taste. Although animal milk magnolia received the highest appreciation in general, plant-based milk alternatives were found to be acceptable by consumers.

Keywords: Gastronomy Tourism, Vegan, Vegetarian, Magnolia, Sensory Analysis Test.

1. INTRODUCTION

Today, healthy eating habits and sustainable food consumption are becoming increasingly important. Especially in recent years, with the increase in environmental sensitivity and healthy living awareness, vegan and vegetarian diets are rapidly becoming widespread. Vegan and vegetarian diets are diets in which individuals limit or completely reject the consumption of animal products in line with health, environmental and ethical concerns. The spread of these diets has led to significant changes in the food industry and increased the need for the development of plant-based products as alternatives to animal foods. Today, innovative products such as plant-based milks, meat alternatives and vegan desserts constitute an important market for both individuals who want to eat healthy and vegan or vegetarian consumers (Özden, 2019). Desserts have an important place in traditional culinary cultures and are usually

prepared using animal-based ingredients. However, desserts containing animal milk and dairy products do not offer a suitable option for vegan and some vegetarian consumers. Therefore, desserts prepared using plant-based milks constitute an important area to meet the needs of these consumer groups. Plant-based milks are also increasingly preferred by individuals with lactose intolerance and consumers who support environmental sustainability. Alternative milks include a variety of plant-based options such as almond milk, oat milk, soy milk and coconut milk (Yılmaz Tuncel & Tuncel, 2022).

This study aims to develop a version of the traditional dessert magnolia suitable for vegan and vegetarian consumers. Magnolia dessert is a cream-based dessert that has become popular in recent years and is usually prepared with cow's milk. In this study, alternative magnolia recipes were developed using almond milk and oat milk instead of cow's milk. The main purpose of the study was to

evaluate the sensory properties of magnolia desserts prepared with different types of milk and to examine how consumers perceive these alternative desserts. In the study, magnolia desserts were prepared using three different types of milk (cow's milk, almond milk and oat milk) and evaluated using sensory analysis. Sensory analysis is a method that allows the evaluation of the characteristics of food products such as taste, smell, consistency and color in line with consumer perceptions. Within the scope of the study, 100 participants from Sinop University Gastronomy and Culinary Arts Department evaluated the prepared magnolia desserts sensorily. Participants were not informed about the types of milk in advance and the evaluations were made based entirely on sensory perception. This study aims to contribute to product diversification for vegan and vegetarian diets. This research, which examines the potential use of plant-based milks in gastronomic products, provides important data for the development of alternatives that support sustainable and ethical nutritional choices in the food industry. In addition, it provides important information about the acceptability of plant-based products by revealing how desserts prepared with plant-based milks are evaluated by consumers in comparison with traditional milk desserts. In the future, more comprehensive research is needed to further develop plant-based milks and alternative desserts and to make them more suitable for consumer expectations. In this context, the results of the study will be indicative of how plant-based alternatives can be more accepted in gastronomic innovation processes. This research makes an important contribution to expanding the areas of use of plant-based milks in the food industry and providing more options for vegan/vegetarian consumers.

2. CONCEPTUAL FRAMEWORK

2.1. Vegan Diet

The term "vegan" was first used in 1944 by Donald Watson, the founder of the Vegan Association in Türkiye, to express the rejection of animal food consumption. Individuals who adopt a vegan lifestyle consume only plant-based sources and do not consume any food of animal origin. In contrast, in a vegetarian diet, animal products such as eggs, dairy products and honey can be consumed optionally in addition to plant-based foods, while the vegan diet completely rejects the consumption and use of all animal-based products (Vatandost & İnce Karaçeper, 2024). Apart from animal foods, they have completely eliminated animal products from their daily lives. Vegans do not use any products such as animal-based leather in their clothing and lives. They are careful not to use cosmetics tested on animals or cleaning materials containing animal fats (Gökçen et al., 2019). The

vegan lifestyle should be adopted not only as a diet but also as the individual's general lifestyle. In order to maintain this lifestyle, it is emphasized that individuals must ensure the continuity of their lives in a way that is compatible with veganism and integrate this philosophy into their lives. Compared to vegetarianism, veganism is considered and envisaged as a diet that offers a healthier lifestyle, prioritizes animal rights and increases the quality of life of individuals (Bilici, 2022).

2.1.1. Types of Vegan Diets

Veganism is a diet that does not consume any animal products and has completely eliminated them from its daily life. Veganism is a diet in which no animal-based food such as meat, chicken, fish, eggs, milk and dairy products and honey are consumed and only plant-based products are preferred. Veganism is also divided into various subcategories (Bilici, 2022).

2.1.1.1. Fruitarianism

The most strict form of vegetarian nutrition is fruitarism (Bilici, 2022). Fruitarism is preferred for various reasons such as religious, moral, environmental, cultural and health. The main purpose of this nutrition style is to avoid causing any harm to animals or plants. In fruitarism, it is possible to consume some vegetables such as cucumbers and peppers, as well as grains. In addition, just like in a raw vegan diet, fruits can generally be preferred raw in fruitarism (Seçim et al., 2022).

2.1.1.2. Rawist Diet

This diet consists of consuming only unprocessed and raw foods. They argue that high-temperature cooking processes make food harmful. Those who follow this diet usually consume foods such as sprouted grains, soaked seeds, peanuts and rice (Bilici, 2022).

2.1.1.3. Zenmacrobiotic Diet

Zenmacrobiotic vegans are divided into two groups. One group consumes grains, legumes, fruits and vegetables in their diet, while the other group only eats grain products and excludes fruits and vegetables (Erk et al., 2019).

2.2. Vegetarian Diet

The origin of the term vegetarian can be traced back to the English word "vegetable", which means vegetable, as it is a vegetable-based diet. However, its real origin is based on the Latin word "vegetus", which means "healthy", "alive" and "full of life" (Seçim et al., 2022). Vegetarianism is a diet that generally involves preferring plant-based foods instead of animal-based foods. Vegetarian individuals consume plant-based foods, while

excluding animal foods (such as red meat, chicken, fish, milk and dairy products, eggs) in limited amounts or completely (Karabudak, 2008; Özcan & Baysal, 2016). The vegetarian diet has a long history, and as of the 20th century, a significant increase in the number of vegetarian individuals has been observed due to factors such as animal rights, religious beliefs and economic factors (Balci, 2018). With the start of the celebration of Vegetarian Day in Türkiye in 2009, awareness of vegetarianism and veganism has increased. In addition, the Vegan Association Türkiye operates as the first official organization in Türkiye (Tunçay Son & Bulut, 2016; Tunçay, 2018).

2.2.1. Types of Vegetarian Diets

Vegetarianism does not support the consumption of animal products. Vegetables, fruits, legumes and grain products are consumed. However, vegetarian diets differ among themselves. While some are limited to animal products, some do not consume any animal products at all.

2.2.1.1. Lacto-Ovo Vegetarianism

In this type of vegetarian, all milk and dairy products, as well as animal products such as eggs, are allowed (Çakıcı et al., 2020). While they do not consume animal products due to their opposition to eating dead animal meat, they consume milk and dairy products and eggs. The vast majority of India has adopted a lacto-ovo vegetarian diet due to religious reasons (Erk et al., 2019).

2.2.1.2. Lacto Vegetarianism

Lacto vegetarianism consumes only milk and dairy products. Apart from this, it does not support the consumption of animal products. Lacto vegetarianism has been defined as a sub-branch of vegetarianism that consumes milk and dairy products (Balci, 2018).

2.2.1.3. Ovo Vegetarianism

In ovo vegetarianism, no animal products, including milk and dairy products and meat products, are

allowed to be consumed. Plant-based foods, grains, legumes, and eggs are allowed to be consumed (Shipman, 2021).

2.2.1.4. Pesco Vegetarianism

It is a type of vegetarianism in which there is no restriction on the consumption of fish and seafood, as well as a plant-based diet, but the consumption of poultry and red meat is prohibited. Although this group is considered one of the subcategories of vegetarianism, they are not classified as vegetarians by the Vegetarian Association Türkiye because they have a dietary habit that includes meat (Bilici, 2022).

2.2.1.5. Semi-Vegetarianism

There are no restrictions on eggs, milk and dairy products. They consume chicken and fish in limited amounts and do not consume red meat at all (Erk et al., 2019).

2.2.1.6. Polo Vegetarianism

Polo vegetarianism can consume poultry as well as plant-based products (Vatan & Türkbaş, 2018).

3. METHOD

3.1. Purpose of the Research

This study aimed to develop a new magnolia dessert for vegan and vegetarian consumers and to perform sensory evaluation of this product.

3.2. Preparation Process of Magnolia Cream

Magnolia cream is produced using three different types of milk in the preparation phase. These milks are animal milk, almond milk and oat milk, respectively. The weights of the milks, which are the main ingredients of all three creams, are equal, and the auxiliary ingredients used are provided in the same amounts and types in all three creams. Granulated sugar is used for sweetening, wheat flour and corn starch are used as density enhancers, and vanilla is used as flavor enhancer (Image 1). The amounts and types of each of these ingredients are standardized in the contents of the creams.



Image 1. Magnolia Cream Ingredients

Source: Created by the authors.

The milks used are animal milk, almond milk and oat milk. In the three creams made, only the milks were different, their weights were the same. 1 liter of milk, 200 grams of sugar, 60 grams of flour, 20

grams of corn starch and 10 grams of vanilla were used. Milk, flour, starch and sugar were put in a pot and mixed. After the ingredients were mixed, they were placed on the stove as shown in Image 2 and stirred continuously until cooked.



Image 2. Magnolia Cream Preparation Process

Source: Created by the authors.

After the cream reached its consistency, it was removed from the stove. 10 grams of vanilla was added to increase flavor. Contact stretch was placed on top to prevent it from drying out. After 12 hours,

it was whipped in a mixer to achieve a homogeneous consistency. The final state of the cream is shown in Image 3.



Image 3. Prepared Form of Magnolia Cream

Source: Created by the authors.

The same process was applied to three different milks. Cream was poured into Magnolia cups and

biscuits and strawberries were added on top. The preparation stage is shown in Image 4.



Image 4. Magnolia Dessert Presentation Process

Source: Created by the authors.

Magnolias were prepared with three different milks for each person who participated in the survey and

offered for tasting. The final state of the magnolias and the survey study are shown in Image 5.



Image 5. Magnolia Dessert Sensory Analysis Test Stage

Source: Created by the authors.

3.3. Data Collection Process

In this study, three different Magnolia recipes were prepared using cow's milk, almond milk, and oat milk, and sensory analyses were conducted on these recipes. The sensory evaluation process employed a survey method and data collection techniques. In the initial phase, plant-based milks (almond milk and oat milk) were used as substitutes for animal milk, taking into consideration the dietary preferences of vegan and vegetarian consumers. Each recipe was formulated with ingredients that catered to the needs of these consumer groups and optimized in terms of taste and nutritional value. During the sensory analysis phase, a participant group of 100 individuals was involved. The participants evaluated three different Magnolia desserts prepared with cow's milk, almond milk,

and oat milk. Each participant was presented with three Magnolia samples, and the participants assessed the organoleptic properties (taste, scent, color and overall acceptability) of the products using a 9-point Likert scale. The evaluations of the panelists were collected using the 9-point hedonic scale developed by Peryam & Pilgrim (1957) which is widely used. This scale classifies the evaluations as follows: 1-Extremely Poor, 2-Very Poor, 3-Poor, 4-Below Average, 5-Average, 6-Above Average, 7-Good, 8-Very good, and 9-Excellent. Sensory tests were conducted during the time period reported as the most effective, between 11:30 and 13:30. For statistical analyses, the Wilcoxon paired test and Friedman test were used. These methods were selected based on the objectives of the study and the requirements of the data collection process.

Table 1. Sensory Analysis Test Format and Panelist Information Based on Number of Panelists

Test No	Test Format	Panel Type and Number of Panelists	Sample Count	Data Analysis
1	Hedonic	Semi-trained: 8-25; Untrained: 80+	1-18	Variance or Rank Analysis

Source: Altuğ Onoğur & Elmacı, (2019).

The Wilcoxon test was used to identify differences between two dependent groups, while the Friedman test was applied to analyze differences among multiple dependent groups. The analyses were conducted using SPSS software, and a significance level of $p < 0.05$ was considered.

Sensory characteristics play a critical role in consumers' processes of evaluating and preferring food products. Sensory analysis methodology aims to examine the visual attributes (shape, color and texture) as well as the taste, aroma, and texture properties of products based on individuals' perceptions of food products (Pala, 2023). Factors such as taste, visual appeal, aroma, and texture are decisive in the acceptance and preference processes of food products (Stone & Sidel, 2004). Particularly, taste stands out as a key criterion in consumer preferences, while aroma is considered an important feature that provides information about the quality of food products and is sought by consumers (Lawless & Heymann, 2010). Sensory evaluation is a field of research that systematically analyzes stimuli perceived through human senses (sight, smell, taste, touch and hearing) and measures responses to these perceptions through scientific methods. These techniques are widely used in sectors such as food, cosmetics, and consumer goods to ensure quality standards, highlight distinctive features of products, and understand consumer preferences (Goldner & Zamora, 2007).

3.4. Data Analysis

The cream samples were subjected to sensory analysis testing on April 1, 2024, by a group of 100 students from the Department of Gastronomy and Culinary Arts at Sinop University. This test aimed to evaluate the taste, odor, color, and overall acceptability characteristics of the cream samples. Participants were not informed about the type of milk used in the preparation of the creams (blind tasting and reverse coding were applied), and the evaluation process was entirely based on participants' sensory perceptions and preferences. In the survey, although the majority of participants were individuals who consumed animal-based milk, positive feedback was received for the almond and oat milk-based creams. These findings suggest that plant-based milks could be considered as an alternative option for individuals who prefer animal milk, highlighting the potential use of plant-based milks in gastronomic practices. This sensory test analysis provides valuable insights into the place of plant-based milks in the food industry and consumer preferences. The results of the sensory analysis of the cream samples offer guidance on how plant-based milks can be utilized in product development and marketing processes.

4. FINDINGS

Table 2 presents the frequency analysis results for the sensory criteria of different magnolia types. The data were evaluated in terms of sensory criteria such as taste, aroma, color, and overall acceptability

(OA). The following observations are made for each criterion;

For cow milk magnolia, all sensory criteria, including taste, aroma, color, and overall acceptability (OA), showed high average values ranging from 8.76 to 8.88, with low standard deviations (ranging from 0.47 to 0.71). This indicates that the participants had a similar perception of the cow milk-based magnolia, and the sensory characteristics of this type generally received high levels of appreciation. In particular, the aroma and color criteria reached very high values, and the evaluations were homogeneous, suggesting that the cow milk-based magnolia is a sensory-consistent and well-liked product. For almond milk magnolia, when examining the average values, taste (6.92), aroma (7.08), color (7.10) and visual quality (5.95) criteria remained at lower levels compared to the cow milk-based magnolia. The overall acceptability (OA_1) had a high standard deviation (1.10), indicating greater diversity among the participants and that the almond milk-based magnolia appealed to more individual preferences. These findings suggest that the taste and visual quality of the almond milk magnolia may have been

perceived differently by participants, resulting in a lower level of appreciation. Finally, oat milk magnolia showed lower average values for taste (4.10), aroma (4.69), color (2.90) and overall acceptability (4.81), with higher standard deviations (particularly in taste and color criteria).

These results indicate that the oat milk-based magnolia created a larger variation among participants and generally received a lower level of appreciation. The particularly low average for the color criterion (2.90) and the high standard deviation suggest that this product was not well-received aesthetically or did not meet the participants' expectations. In conclusion, the cow milk-based magnolia exhibited the highest averages and the lowest variability in sensory criteria, resulting in a more homogeneous level of appreciation. On the other hand, the almond and oat milk-based magnolias showed lower and more variable results. These findings demonstrate that the type of milk used significantly affects the sensory perception of the magnolia and different milk types are appreciated by consumers to varying degrees.

Table 2. Sensory Criteria and Overall Acceptability Frequency Analysis Findings for Different Magnolia Types (n=100)

Magnolia Type	Sensory Criteria	Mean	Std. Deviation	Minimum	Maximum
Cow Milk Magnolia	Taste	8.76	0.71	5	9
	Aroma	8.84	0.50	5	9
	Color	8.88	0.47	5	9
	OA	8.80	0.60	7	9
Almond Milk Magnolia	Taste	6.92	0.74	5	9
	Aroma	7.08	0.69	5	9
	Color	7.10	0.59	5	9
	OA	5.95	1.10	2	9
Oat Milk Magnolia	Taste	4.10	2.69	2	9
	Aroma	4.69	2.56	2	9
	Color	2.90	2.04	1	9
	OA	4.81	1.24	2	9

Table 3 presents the results of the Friedman test for taste evaluations across three different types of magnolia (cow milk, almond milk and oat milk). The cow milk magnolia achieved the highest average rank score of 2.91, indicating that participants preferred this type more than the others. Additionally, this type had a low standard deviation of 0.71, which suggests that the evaluations among participants were consistent and the taste assessment was homogeneous. The almond milk magnolia (mean rank 1.82) and oat milk magnolia (mean rank 1.28) received lower average rank scores, with oat milk magnolia showing a significantly higher standard deviation of 2.69. This

indicates a greater variability in the evaluations for oat milk magnolia and suggests that there were more noticeable differences in preferences among participants. The Chi-square value was found to be 153.789 with a p-value of 0.000, which indicates that the differences in taste evaluations between the magnolia types are statistically significant and not due to random chance. Participants' taste preferences differed significantly across the types of magnolia. These findings suggest that the taste characteristics of the magnolia varieties had varying degrees of impact on the participants, making this an important factor to consider in the marketing of these products.

Table 3. Friedman Test Findings for Taste Evaluation Criterion Across Three Magnolia Types

Magnolia Types	Mean Rank	Average	Std. Deviation
Cow Milk Magnolia	2.91	8.76	0.71
Almond Milk Magnolia	1.82	6.92	0.74
Oat Milk Magnolia	1.28	4.10	2.69

Friedman Test Results: $N=100$; $\chi^2=153.789$; Degrees of Freedom (df)=2; $Asymp. Sig=0.000$

Table 4 presents the results of the Wilcoxon Signed Ranks Test applied to the "Taste" criterion for comparisons between three different varieties of magnolia: almond milk magnolia (Taste_1), cow milk magnolia (Taste_2), and oat milk magnolia (Taste_3). The aim of this analysis was to evaluate the statistical significance of taste differences among these magnolia varieties. In the comparison between Taste_1 (almond milk magnolia) and Taste_2 (cow milk magnolia), 94 participants rated cow milk magnolia higher, indicating a strong preference for this variety. The mean rank for the negative ranks was 48.50 and the rank sum was 4559.00. With a z-value of -9.390 and a p-value of 0.000, the result is statistically significant, meaning there is a clear preference for cow milk magnolia over almond milk magnolia in terms of taste. For the comparison between Taste_3 (oat milk magnolia) and Taste_2 (cow milk magnolia), 90 participants preferred cow milk magnolia, confirming a similar trend of preference. The mean rank for the negative

ranks was 45.50 and the rank sum was 4095.00. The z-value of -8.432 and p-value of 0.000 indicate that the difference between these two varieties is also statistically significant, with cow milk magnolia being favored over oat milk magnolia. Finally, in the comparison between Taste_3 (oat milk magnolia) and Taste_1 (almond milk magnolia), 65 participants rated almond milk magnolia higher, again indicating a preference for it. The mean rank for the negative ranks was 42.62, and the rank sum was 2770.00. The z-value of -7.321 and p-value of 0.000 confirm that this difference is statistically significant as well, with almond milk magnolia being preferred over oat milk magnolia. In conclusion, the Wilcoxon Signed Ranks Test results indicate statistically significant taste preferences across all three comparisons. Cow milk magnolia emerged as the most preferred variety, followed by almond milk magnolia, while oat milk magnolia was the least favored variety. These findings provide valuable insights into consumer preferences for different magnolia varieties, which can inform future product development and marketing strategies in the gastronomy field.

Table 4. Wilcoxon Signed Ranks Test for the Taste Criterion Across Different Magnolia Varieties and Statistical Analysis Findings

Comparison	Rank Type	n	Mean Rank	Rank Sum	z	p
Taste_1 - Taste_2	Negative Ranks	94	48.50	4559.00	-9.390	0.000
	Positive Ranks	2	48.50	97.00		
	Ties	4				
	Total	100				
Taste_3 - Taste_2	Negative Ranks	90	45.50	4095.00	-8.432	0.000
	Positive Ranks	0				
	Ties	10				
	Total	100				
Taste_3 - Taste_1	Negative Ranks	65	42.62	2770.00	-7.321	0.000
	Positive Ranks	10	8.00	0.00		
	Ties	25				
	Total	100				

Table 5 presents the Friedman test results for the "scent" evaluation criterion across three different magnolia varieties. The results indicate a statistically significant difference in the scent evaluations of the three magnolia types ($Asymp. Sig = 0.00$). This finding highlights that the scent assessments for the different magnolia varieties differ notably. When examining the mean ranks (rank averages), it is evident that the magnolia made with cow's milk (mean rank=2.91) holds a higher rank compared to the other two varieties. On

the other hand, almond milk-based magnolia (mean rank=1.84) and oat milk-based magnolia (mean rank=1.26) have lower mean ranks. These results suggest that the cow's milk magnolia was perceived more positively in scent evaluations and was more favorably rated by participants. The average scores and standard deviations further elucidate the general trends in the evaluations and the consistency of these assessments. The cow's milk magnolia exhibited a high average score of 8.84 with a low standard deviation of 0.50, indicating a strong

consensus among participants, with a generally favorable scent profile. In contrast, the oat milk magnolia had a lower average score of 4.69 and a higher standard deviation of 2.56, which signifies greater variability in evaluations, including more negative assessments. These findings underscore the significant impact that the choice of milk type has on the scent profile of the magnolia varieties. The use of cow's milk in magnolia products leads to a more positively perceived scent, whereas

alternative milk types such as oat milk result in more varied and generally less favorable evaluations. This indicates that the formulation and selection of ingredients are crucial factors in shaping consumer perception and satisfaction. Specifically, the variability in the oat milk-based magnolia suggests that alternative ingredients might introduce a wider range of consumer preferences, potentially impacting product acceptance and market success.

Table 5. Findings of the Friedman Test for Aroma Evaluations Across Three Different Magnolia Types

Magnolia Types	Mean Rank	Average	Std. Deviation
2_ Cow Milk Magnolia	2.91	8.84	0.50
1_ Almond Milk Magnolia	1.84	7.08	0.69
3_ Oat Milk Magnolia	1.26	4.69	2.56

Friedman Test Results: $N=100$; $\chi^2=163.501$; Degrees of Freedom (df)=2; $Asymp. Sig=0.00$

The results of the Wilcoxon Signed Ranks Test, presented in Table 6, indicate statistically significant differences in the scent evaluations of different magnolia types. The aim of the test was to determine whether the rankings of the three different magnolia types differed significantly in terms of scent perception. Initially, the comparison between Scent_1 and Scent_2 reveals that Scent_1 was evaluated more negatively than Scent_2. The z-value of -9.110 and the p-value of 0.000 indicate that the difference between Scent_1 and Scent_2 is statistically significant. A majority of negative ranks were assigned to Scent_1, indicating that participants perceived the scent of Scent_1 to be less favorable compared to Scent_2. A similar significant difference was found in the comparison between Scent_3 and Scent_2. Scent_2 received a higher rank, while Scent_3 was evaluated more negatively. The lower rankings assigned to Scent_3 were confirmed by the z-value of -8.623 and the p-value of 0.000,

indicating that this difference was statistically significant. The majority of participants rated Scent_3 lower than Scent_2.

Finally, the comparison between Scent_3 and Scent_1 also yielded similar results. Scent_1 received higher rankings, while Scent_3 received the lowest ranks, and this difference was found to be statistically significant. The rankings for Scent_3 were predominantly negative. The z-value of -6.852 and the p-value of 0.000 further validate this significant difference. In conclusion, the analysis reveals significant differences in scent perception among the magnolia types. Participants rated Scent_1 the highest, while Scent_3 received the lowest ratings. These findings reflect the impact of the ingredients, particularly the type of milk used, on the scent perception and highlight a clear divergence in consumer preferences. In this context, the materials used in the magnolia types, especially the types of milk, play a crucial role in scent perception, leading to notable differences in consumer perceptions.

Table 6. Wilcoxon Signed Ranks Test Findings for Scent Criterion Ranking and Statistical Analysis Across Magnolia Types

Comparison	Rank Type	n	Mean Rank	Rank Sum	z	p
Scent_1 - Scent_2	Negative Ranks	91	47.92	4361.00	-9.110	0.000
	Positive Ranks	2	5.00	10.00		
	Ties	7	-	-		
	Total	100	-	-		
Scent_3 - Scent_2	Negative Ranks	94	49.50	4653.00	-8.623	0.000
	Positive Ranks	2	0.00	3.00		
	Ties	4	-	-		
	Total	100	-	-		
Scent_3 - Scent_1	Negative Ranks	56	28.50	2770.00	-6.852	0.000
	Positive Ranks	0	8.00	0.00		
	Ties	44	-	-		
	Total	100	-	-		

Table 7 presents the results of the Friedman Test, indicating that statistically significant differences exist in the color evaluations of three different types of magnolia. The objective of the test was to assess the differences in color perception between magnolia made with cow's milk, almond milk, and oat milk. Firstly, the magnolia made with cow's milk received the highest mean rank, with a value of 2.94. The average score for this variety was 8.88, with a standard deviation of 0.47. This suggests that participants generally rated the magnolia made with cow's milk more favorably in terms of color evaluation. The almond milk-based magnolia, in contrast, had a lower mean rank (1.98) compared to the cow's milk variety. Its average score was 7.10, with a standard deviation of 0.59. While almond milk magnolia received a somewhat lower color evaluation, the difference was not as pronounced as in comparison to the other types. Finally, the oat milk-based magnolia received the lowest mean rank (1.09) for color evaluation. The average score for this type was 2.90, with a standard deviation of 2.04.

This result indicates that the oat milk-based magnolia was rated the lowest in terms of color, signaling a significantly lower color perception for this variety. The Chi-Square value of the test was 177.854, with a degree of freedom (df) of 2, and an asymptotic significance (p) value of 0.00. These findings clearly indicate a statistically significant difference in the color evaluations among the three types of magnolia. The p-value of 0.00, being less than 0.05, confirms that there are statistically significant differences in color perception between the magnolia varieties made with cow's milk, almond milk, and oat milk. In conclusion, the analysis of color perception for the different magnolia types reveals that the milk type used significantly influences the color evaluations. Magnolia made with cow's milk received the highest color perception rating, while the oat milk-based magnolia received the lowest. These results underscore that color evaluation is a critical factor perceived by participants, and that different milk types have a distinct impact on color perception.

Table 7. Friedman Test Findings for Color Evaluations of Three Different Magnolia Varieties

Magnolia Types	Mean Rank	Average	Std. Deviation
2_ Magnolia with Cow's Milk	2.94	8.88	0.47
1_ Magnolia with Almond Milk	1.98	7.10	0.59
3_ Magnolia with Oat Milk	1.09	2.90	2.04

Friedman Test Results: N Value=100; Chi-Square=177.854; Degrees of Freedom (df)=2; Asymptotic Sig. (p)=0.00

According to the results of the Wilcoxon Signed Ranks Test, all comparisons made regarding the color criterion for magnolia varieties show statistically significant differences. The rankings related to color perception reflect the impact of the milk types used on the color evaluations. The first comparison was made between Color_1 (magnolia made with cow's milk) and Color_2 (magnolia made with almond milk). In this comparison, Color_1 was found to be rated more favorably compared to Color_2. Negative ranks were recorded for 92 participants, while only one participant rated Color_2 higher. The z-value of -9.009 and a p-value of 0.000 confirm that the difference between Color_1 and Color_2 is statistically significant. The second comparison was between Color_3 (magnolia made with oat milk) and Color_2. Here, Color_3 received a lower color evaluation, and the majority of participants rated Color_2 higher. Negative ranks were recorded for 96 participants, and no positive ranks were found, indicating that Color_3 was

ranked lower than Color_2. The z-value of -8.697 and the p-value of 0.000 indicate that the difference is statistically significant. Finally, the comparison between Color_3 and Color_1 also revealed significant differences. It was found that Color_1 received higher rankings compared to Color_3. In this comparison, 90 negative ranks and 4 positive ranks were recorded, showing that Color_1 received a more favorable evaluation than Color_3. The z-value of -8.469 and the p-value of 0.000 further confirm that the difference is statistically significant. Overall, the results of the Wilcoxon test demonstrate that among the magnolia varieties, the one made with cow's milk has the highest color perception, while the oat milk-based magnolia received the lowest. The almond milk-based magnolia received a lower color ranking than the cow's milk variety, while the oat milk variety was ranked the lowest among all types. These findings suggest that color perception can vary depending on the type of milk used, and participants regarded it as an important factor significantly influencing their color evaluations.

Table 8. Wilcoxon Signed Ranks Test Findings for Color Evaluation Criterion in Magnolia Varieties: Ranking and Statistical Analysis

Comparison	Rank Type	n	Mean Rank	Rank Sum	z	p
Color_1 - Color_2	Negative Ranks	92	46.97	4321.00	-9.009	0.000
	Positive Ranks	1	50.00	50.00		
	Ties	7	-	-		
	Total	100	-	-		
Color_3 - Color_2	Negative Ranks	96	48.50	4656.00	-8.697	0.000
	Positive Ranks	0	0.00	0.00		
	Ties	4	-	-		
	Total	100	-	-		
Color_3 - Color_1	Negative Ranks	90	49.17	4425.00	-8.469	0.000
	Positive Ranks	4	10.00	40.00		
	Ties	6	-	-		
	Total	100	-	-		

The results of the Friedman Test, conducted to evaluate the general acceptability of three different magnolia varieties, reveal significant findings. The magnolia made with cow's milk (2) has the highest mean rank, with an average score of 8.80, indicating its higher acceptance compared to the other varieties. The standard deviation of 0.60 suggests that the evaluations were relatively consistent, with minimal variation among participants. On the other hand, the almond milk-based magnolia (1) ranks second with an average score of 5.95, while the oat

milk-based magnolia (3) has the lowest mean score of 4.81. Notably, the standard deviation for oat milk-based magnolia is higher at 1.24, suggesting greater diversity in participant opinions. The Chi-Square value for the Friedman test is 153.116, with an Asymp. Sig ($p=0.05$), indicating a statistically significant difference among the three magnolia varieties. This suggests that, in terms of general acceptability, the cow's milk-based magnolia is preferred over the other alternatives, while the oat milk-based magnolia is less accepted.

Table 9. Friedman Test Analysis Findings for General Acceptability Evaluations Across Three Magnolia Varieties

Magnolia Varieties	Rank Mean	Average	Std. Deviation
2_ Magnolia with Cow's Milk	2.96	8.80	0.60
1_ Magnolia with Almond Milk	1.71	5.95	1.10
3_ Magnolia with Oat Milk	1.33	4.81	1.24

Friedman Test Results: N Value=100; Chi-Square=153.116; Degrees of Freedom (df)=2; Asymptotic Sig. (p)=0.05

Table 10 presents the results of the Wilcoxon Signed-Ranks Test, performed to assess the general acceptability of three different magnolia varieties based on the General Acceptability Evaluation (GAE) criterion. The test analyzes the differences between each pair of magnolia varieties by examining rank types and average ranks. The first comparison evaluates the difference between almond milk-based magnolia (GAE_1) and cow's milk-based magnolia (GAE_2). The results indicate that cow's milk-based magnolia received a higher acceptability score. The number of negative ranks is 98, with an average rank of 49.50, demonstrating that the majority of participants rated the cow's milk-based magnolia more favorably. The Z value of -8.680 and the p-value of 0.000 indicate a statistically significant difference, confirming that the acceptability of cow's milk-based magnolia is significantly higher than that of almond milk-based magnolia. The second comparison examines oat

milk-based magnolia (GAE_3) and cow's milk-based magnolia (GAE_2). The results similarly reveal that cow's milk-based magnolia received a higher acceptability score. The number of negative ranks is 94, with an average rank of 47.50, indicating that most participants preferred the cow's milk-based magnolia. The Z value of -8.572 and the p-value of 0.000 show that the difference is statistically significant, suggesting that cow's milk-based magnolia is more accepted than oat milk-based magnolia. The third comparison involves oat milk-based magnolia (GAE_3) and almond milk-based magnolia (GAE_1). In this case, the number of negative ranks is 64, and the number of positive ranks is 24, with an average rank of 52.53. The Z value of -1.299 and the p-value of 0.194 indicate that this difference is not statistically significant ($p>0.05$), suggesting that there is no significant difference in general acceptability between oat milk-based and almond milk-based magnolia. In conclusion, cow's milk-based magnolia receives significantly higher acceptability scores than both almond milk-based and oat milk-based magnolias.

While almond milk-based magnolia shows lower acceptability compared to cow's milk-based

magnolia, it is more favorably accepted than oat milk-based magnolia.

Table 10. Wilcoxon Signed-Ranks Test Findings for General Acceptability Criteria Across Magnolia Varieties

Comparison	Rank Type	n	Average Rank	Rank Total	Z	p
GAE_1 - GAE_2	Negative Ranks	98	49.50	4851.00	-8.680	0.000
	Positive Ranks	0	0.00	0.00		
	Ties	2	-	-		
	Total	100	-	-		
GAE_3 - GAE_2	Negative Ranks	94	47.50	4465.00	-8.572	0.000
	Positive Ranks	0	0.00	0.00		
	Ties	6	-	-		
	Total	100	-	-		
GAE_3 - GAE_1	Negative Ranks	64	52.53	3362.00	-1.299	0.194
	Positive Ranks	24	23.08	554.00		
	Ties	12	-	-		
	Total	100	-	-		

5. CONCLUSION AND DISCUSSION

This study examined the sensory properties of magnolia dessert prepared with plant-based milk alternatives (almond milk and oat milk) as an alternative dessert option for vegan and vegetarian consumers. Additionally, a comparative analysis was conducted with traditional magnolia made using cow's milk. The findings revealed that magnolia prepared with cow's milk received the highest scores across all sensory criteria-taste, aroma, color, and overall acceptability-and was consistently preferred by participants. While almond milk magnolia received lower ratings than its cow's milk counterpart, it was moderately accepted, particularly in terms of taste and aroma. In contrast, oat milk magnolia received the lowest scores in all sensory criteria and was the least preferred among the samples. These results indicate that the use of plant-based milk in desserts like magnolia significantly affects consumer preferences. Statistical analyses confirmed significant differences among the three types of magnolia in terms of taste, aroma, color and overall acceptability ($p < 0.05$). Cow's milk magnolia had the highest mean ranking in all criteria, whereas oat milk magnolia ranked the lowest. The results of the Wilcoxon Signed-Rank Test further confirmed that cow's milk magnolia was significantly more accepted than both almond milk and oat milk magnolia ($p < 0.05$). Additionally, almond milk magnolia was preferred over oat milk magnolia. These findings highlight the potential of plant-based milk alternatives in gastronomy while also emphasizing the need for improving the sensory characteristics of certain alternatives, such as oat milk. The lower performance in color and taste suggests that formulation adjustments are necessary to better meet consumer expectations. Future studies could focus on optimizing the sensory properties of plant-based milk formulations

to enhance their appeal. Moreover, further research involving other plant-based milk varieties, such as soy milk and coconut milk, could expand knowledge in this field and provide more comprehensive insights into consumer preferences. In conclusion, this study demonstrates that plant-based milk alternatives significantly influence consumer preferences in dessert applications and provides valuable data for product development. Enhancing the sensory properties of plant-based alternatives in the gastronomy and food industry is crucial not only for meeting the needs of vegan and vegetarian consumers but also for appealing to a broader consumer base.

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