# Determination of Taste Profile in Third Wave Coffee Brewing Methods Using Sensory Analysis

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| Duyusal Analiz Kullanılarak Üçüncü Nesil Kahve Demleme Yöntemlerinde Tat Profili Belirleme | Determination of Taste Profile in Third Wave Coffee Brewing Methods Using Sensory Analysis |
|---|---|

*Öz*

Bu çalışmada, üçüncü nesil kahve demleme tekniklerinin (Chemex, V60 ve Syphon) duyusal özellikler üzerindeki etkileri incelenmiştir. Araştırma, Mersin'deki bir kahve işletmesinde düzenlenen bir tadım atölyesinde gerçekleştirilmiş ve 18-55 yaş aralığındaki 18 gönüllü yarı eğitilmiş panelist tarafından yürütülmüştür. Panelistler, kahveleri 9 puanlık hedonik skala üzerinden subjektif olarak değerlendirmişlerdir. Elde edilen sonuçlar, kullanılan demleme yöntemlerine bağlı olarak kahvelerin görünüş, tat, koku ve doku gibi duyusal özelliklerinde istatistiksel olarak anlamlı farklılıklar göstermiştir. V60 yöntemiyle hazırlanan kahvenin, diğer yöntemlerle hazırlananlara kıyasla daha yüksek puanlar aldığı tespit edilmiştir. Friedman testi ve Wilcoxon işaretli sıralar testi ile bu farklılıklar doğrulanmıştır. Araştırma sonuçları, üçüncü nesil kahve demleme yöntemleri arasındaki duyusal farklılıkları ortaya koymakta ve V60 yönteminin diğerlerine göre duyusal üstünlüğünü belgelemektedir. Bu bulgular, kahve endüstrisinde ürün geliştirme ve pazarlama stratejileri için önemli bir referans teşkil edebilir.

*Anahtar Kelimeler:* Gastronomi, Tat Profili, Üçüncü Nesil Kahve Demleme, Duyusal Analiz

*Abstract*

In this study, the effects of third-generation coffee brewing techniques (Chemex, V60, and Syphon) on sensory properties were examined. The research was conducted at a coffee tasting workshop in Mersin, involving 18 semi-trained panelists aged between 18 and 55. Panelists evaluated the coffees subjectively using a 9-point hedonic scale. The results revealed statistically significant differences in sensory attributes such as appearance, taste, aroma, and texture depending on the brewing methods used. Coffee prepared using the V60 method scored higher than those brewed using other methods. These differences were confirmed using the Friedman test and the Wilcoxon signed-rank test. The findings highlight the sensory differences among third-generation coffee brewing techniques and document the sensory superiority of the V60 method over others. These insights could serve as an important reference for product development and marketing strategies in the coffee industry.

*Keywords*: Gastronomy, Taste Profile, Third-Wave Coffee Brewing, Sensory Analysis

**Makale Türü:** Araştırma Makalesi       **Paper Type:** Research Article

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## 1. Introduction

In today's food industry, sensory analysis methods play a crucial role in evaluating and comprehending consumers' perceived attributes of foods (Özkaya et al., 2010). This approach seeks to objectively assess, quantify, analyze, and interpret the sensory characteristics of food related to auditory, tactile, olfactory, and visual aspects. Sensory evaluation criterion analysis involves participants sharing their post-tasting experiences and preferences (Kılıç, 2021: 566). This method has gained considerable popularity, especially within the realm of gastronomy.

Coffee holds a significant position in contemporary commerce, ranking as the second-largest traded commodity after petroleum (Mussatto et al., 2011). The global coffee market's value is estimated at approximately $200 billion annually, with over 60 million individuals employed in the coffee industry (Samper et al., 2017). Presently, approximately two billion cups of coffee are consumed worldwide every day (Poole et al., 2019; Rattan et al., 2015).

Despite its traditional association as a hot beverage, coffee has emerged prominently as a ready-to-drink packaged product, particularly in countries such as the USA, France, Korea, Taiwan, and Scandinavia (Grand View Research, 2018). The primary drivers behind this preference are cost-effectiveness, convenience, and sensory enjoyment (Wang & Yu, 2016). Furthermore, with the diversification of coffee consumers, the burgeoning popularity of café culture, and the processes of industrialization, notable transformations have unfolded in the realm of coffee (İnce, 2018:22).

This evolution has prompted heightened consumer awareness regarding coffee, a burgeoning interest in novel tastes and experiences, and the ascent of third-wave coffee shops (İstanbullu-Dinçer, Gedik, & Özdemir-Güzel, 2016: 811). Today, coffee has transcended its status as merely a beverage to become a cultural and social emblem (Heise, 2001: 31). In this context, coffee has evolved beyond mere consumption to embody sociological elements, delineating a societal phenomenon (Giddens et al., 2006).

This shift in coffee culture has also impacted the locales where coffee consumption takes place. Cafés have evolved into social hubs where individuals convene not only to consume coffee but also to socialize, entertain, and immerse themselves in diverse cultures (Hattox, 1998:79). Similarly, Habermas (2012: 100) characterizes these venues as preferred socialization points, where individuals gather not solely for coffee consumption but also for engaging in conversations, exchanging ideas, and nurturing interpersonal relationships. This social metamorphosis has rendered coffee indispensable within these spaces and has catalyzed the emergence of the third-wave coffee movement.

The ethos of the third-wave coffee movement revolves around the coffee experience (Tolga, 2017). This movement distinguishes itself by prioritizing quality and experience in coffee consumption (Torz & Macatonia, 2016). Third-wave coffee brewing entails presenting coffee to consumers using specialized brewing equipment, affording individuals the opportunity to personalize their coffee through roasting and brewing methods, thereby enhancing the personal and enriching dimensions of coffee consumption. Broadly, third-wave coffee seeks to elevate the coffee experience by emphasizing experiential preparation and consumption (Jolliffe, 2010). Moreover, third-wave coffee has not only spurred innovation within the service sector but has also positioned coffee as a luxury consumer commodity, owing to its personalized presentations and specialized equipment, thus rendering coffee consumption a luxurious ritual that defines a distinct lifestyle for coffee enthusiasts. Furthermore, the proliferation of coffee additives and variations aims to cater to a diverse audience and accommodate varied taste preferences.

It is widely acknowledged that additives incorporated into coffee significantly influence its taste profiles. For instance, viscosity enhancers like milk and cream can mitigate the bitterness of coffee

while altering its texture, aroma, and appearance (Keast, 2008; Parat-Wilhelms et al., 2005). Consequently, it is imperative for producers to meticulously select and utilize components in coffee products at optimal levels to maximize consumer satisfaction. Consumer acceptance tests are commonly employed to gauge consumers' preferences for these additives and ascertain their significance in the success of consumer products (Meilgaard et al., 2016; Nielsen, 2010).

The significance of sensory analysis in understanding coffee consumption has garnered increasing recognition in scholarly discourse. Stokes, O'Sullivan and Kerry (2017) found that filter coffees were perceived as superior to instant coffees in terms of flavor and aroma, with third-wave coffees being associated with higher quality. Chapko and Seo (2019) concluded that serving temperature significantly influences coffee's sensory attributes and identified a significant relationship between flavor and temperature. Dulsat-Serra, Quintanilla-Casas, and Vichi (2016) demonstrated in their study that coffee aroma substantially impacts sensory quality perception, serving as a pivotal factor in assessing coffee quality.

This research focuses on the sensory analysis of coffee prepared using third-wave brewing methods (Chemex, V60, and Syphon), thoroughly investigating the effects of these methods on consumers' tasting experiences. Within this framework, by synthesizing existing literature, this study seeks to deepen the comprehension of the coffee consumer experience and systematically analyze the effects of the most preferred brewing methods on consumers based on data derived from interviews with industry stakeholders.

Additionally, insights gleaned from sensory analysis of coffee consumers' preferences aim to furnish valuable inputs to the coffee industry, fostering quality enhancements and augmenting consumer satisfaction. Identifying the most suitable product profile for a business is paramount. Consumer acceptance testing can assess the degree of consumer preference for products, thus constituting an essential element for the success of consumer products (Meilgaard et al., 2016; Nielsen, 2010). This study's objective diverges from others by endeavoring to ascertain how different, yet unexplored, brewing methods influence the taste profile of coffee with identical characteristics and whether these distinct brewing methods engender significant differences in consumer taste perception through sensory analysis.

## 2. Conceptual Framework

### 2.1. Evolutionary Transformation in Coffee Culture

In the 1920s, coffee culture was predominantly consumed at home, known as the "First Wave Coffee Approach." During this period, coffee is consumed using more economical and simpler methods (Halevy, 2011). However, with the industrial revolution, work life and socialization have rapidly changed, leading to the emergence of the second-wave coffee approach. In the second-wave coffee approach, chain coffee shops became popular venues for socialization alongside coffee consumption (Heise, 2001: 31; Habermas, 2012: 100). Famous coffee chains such as Starbucks and Gloria Jean made significant progress nationally during this period (Giovannucci, 2001; İstanbullu-Dinçer et al., 2016). Additionally, new coffee varieties such as "espresso" and "latte" entered consumers' lives during this period, with espresso-based coffees becoming the staple product of coffee shops (Tolga, 2017: 46). Second-wave coffee shops provided an environment where customers could spend longer periods, offering free Internet access and a comfortable atmosphere, thus enriching the coffee experience.

In the third-wave coffee approach, the emphasis shifted towards savoring the taste of coffee and offering products tailored to individual preferences (İstanbullu-Dinçer et al., 2016:811). Third-wave coffee shops were often small establishments located in neighborhoods rather than city centers. Individuality became prominent during this period, and products were prepared according to customer

demands (Holbrook & Hirschman, 1982: 135). In the third-wave coffee culture, consumers tend to choose their brewing method and beans, allowing them to be involved in the production process. Third-wave coffee attracts customers with high-quality coffee products (Tolga, 2017: 47; Tüzün, 2018: 80). It caters to individuals who seek knowledge about the entire process, from coffee cultivation to processing, brewing, and serving, and who are looking for quality coffee.

The era of third-wave coffee represents a significant transformation of the coffee industry. During this period, coffee consumers care not only about what coffee is but also about its source, production process, and preparation method (Tolga, 2017: 50). Additionally, methods of accessing quality coffee came to the fore during this period, and different brewing methods are used with regional beans to emphasize taste. Brewing methods are of great importance to coffee quality.

This study examines third-wave coffee brewing methods, namely the Chemex, Pour Over (V60), and Syphon methods. The details of these methods are provided below: Chemex: Invented by German chemist Dr. Peter Schlumbohm in the United States in 1941. Chemex is a coffee brewing method. When brewing coffee using the Chemex apparatus, attention is paid to the correct proportions of coffee and water. It is a manual brewing method that ensures that coffee is brewed evenly. Coffee prepared using the Chemex method typically has a clear color, and the taste of coffee beans is distinctly felt (Kement et al., 2022: 280). The glass structure of Chemex allows the observation of the brewing process.



**Photo 1:** Chemex Brewing Equipment

Pour Over (V60) method: Often preferred pour-over coffee and was used for brewed coffees. V60 is a specially designed brewing apparatus that ensures that water evenly reaches the coffee during the brewing process. Coffees prepared using the V60 method typically have a clear appearance, and the aroma of the coffee beans is prominent. The recommended coffee-to-water ratio for the Pour Over method is usually 30 g of coffee to 480 ml of water, and the brewing process is completed in approximately 3 min at a boiling point of approximately 94 °C.

**Photo 2:** Hario V60 Brewing Equipment

Syphon or vacuum coffee: A coffee brewing method developed in Germany in the early 19th century. After its origin in Europe, this method spread to America and then to Japan. Brewing and watching coffee prepared using the syphon method is enjoyable. Syphons are also known as vacuum pots and French balloons. In this method, the coffee is processed using steam and pressure.

The two-part glass equipment consisted of two sections: bottom and top chambers. The bottom chamber was the glass area where the water was placed. In the middle, an iron handle connected the two chambers. The top section is where coffee is placed.

The syphon equipment was used to ensure that the coffee beans remained in the hot water and were filtered (Kement et al., 2022: 281). This process begins with boiling water in the bottom part of the equipment, where the ground coffee beans are placed in the top part. The evaporation of water in the bottom section was used to extract and brew the aroma of the coffee beans in the top section. When the water boils, the steam comes into contact with the coffee in the upper chamber and helps brew the coffee. The bottom and top parts of the syphon were subjected to various pressures. This pressure difference caused the water to rise to the top and brew the coffee.

After the coffee was brewed, the pressure of the heated water in the bottom section decreased, and the brewed coffee in the upper section was filtered back into the bottom section through a filter. This filtration process cleans coffee and returns it to the bottom section. The syphon coffee brewing method not only offers a visually impressive experience but is also a popular brewing method that brings out the flavors and tastes of coffee more clearly.



**Photo 3:** Syphon Brewing Equipment

## 3. Materials and Methods

In the food industry, understanding consumer preferences heavily relies on sensory attributes, which play a pivotal role in determining the quality of food products and ensuring consumer satisfaction (Silici S., & Kutluca S. 2005). To achieve this, food producers employ sensory evaluation methods to grasp consumer preferences and refine their products accordingly. This evaluation process aims to gauge the holistic sensory experience of products, encompassing visual, taste, aroma, and texture attributes. These factors significantly influence how consumers perceive and choose food products, providing essential insights for producers to align their offerings with consumer expectations and gain a competitive edge in the market by delivering more appealing and gratifying products.

Food producers must align their product designs and developments with consumer expectations (Piggott et al., 1998). In this context, this study adopts a sensory analysis methodology to investigate the impact of the three most preferred coffees produced using the third-wave coffee brewing technique on perceived taste and overall acceptability among consumers. The study enlisted a panel of 18 individuals aged between 18 and 55 years with a semi-educated background.

The primary objective of this study is to compare different brewing methods for the same brand of coffee, focusing on consumer preferences rather than evaluating brand image. The aim is to discern which brewing method garners preference and understand the underlying reasons among consumers.

Third-wave coffee brewing methods possess characteristics that engage all five senses. This study concentrates on how these methods influence visual, auditory, olfactory, taste, and tactile senses during coffee preparation and presentation. By utilizing the same sample composed of customers from the same business, the study ensured control over variables such as environmental factors. Additionally, efforts were made to minimize disparities in hearing and tactile senses by conducting experiments with consistent individuals and equipment.

Consequently, the research meticulously evaluates the three most preferred brewing methods based on criteria such as "appearance," "flavor," "texture," "aroma," and "overall acceptability."

In this context, the primary question posed to the panelists in the research is formulated as follows: "What are your opinions on the flavor, texture, aroma, and overall acceptability of third-wave coffee prepared using different brewing methods?" This question encapsulates the panelists' assessments of the sensory properties of the coffees under scrutiny and their overall acceptability. The primary objective of this research was to comprehend and evaluate panelists' responses to this question to discern the sensory perceptions and general preferences of coffees prepared using different brewing methods (Brown, 2019). This approach is a widely accepted method that yields valuable insights into consumer perceptions and preferences for food products (Johnson et al., 2020). This study could significantly influence product development and marketing strategies in the coffee industry and provide valuable insights to enhance the coffee consumer experience (Garcia, 2018).

The panelists' evaluations were conducted using a 9-point hedonic scale rating test developed by Peryam and Pilgrim (1957). In this scale, panelists rated the coffees on a scale ranging from 1 to 9, with descriptors ranging from "extremely poor" to "excellent."

The analysis was conducted during the most effective time frame for sensory tests, which was between 10:00 and 13:30. The coffees prepared for sensory analysis were assessed, as depicted in Figure 1.

These details offer comprehensive insights into the perceived coffee attributes among panelists and the overall evaluation of the product. Conducting the sensory analysis within a specific timeframe is deemed crucial for the reliability and consistency of the results.
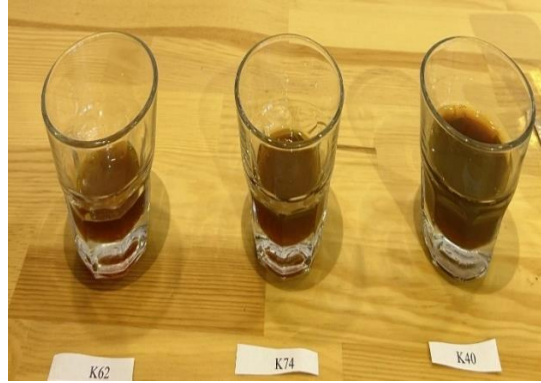
**Photo 4:** Product Evaluation

The coffees obtained using different brewing techniques were arranged and evaluated by panelists, as shown in Photo 2. During the research process, "blind tasting" and "reverse coding" strategies were employed to ensure reliable data collection and minimize subjective influences. Blind tasting is defined as a methodology that requires product evaluators to assess products based solely on sensory attributes such as appearance, taste, aroma, and texture, without knowing the identities of the products. This approach prevents evaluators from making judgments based on bias or pre-existing knowledge. Widely used, especially in the evaluation of food or beverage products, this method allows for objective assessment of products in terms of taste and quality (Stolzenbach et al., 2013: 95).



**Photo 5:** Product Evaluation

Another sensory analysis method, "reverse engineering," is a process used to understand the unique characteristics of a food product through sensory analysis in order to determine its contents or components (Brown & Smith, 2020). The primary focus of this method is to dissect and understand the sensory properties of a product, such as flavor profile, aroma, texture, etc. Reverse engineering is a technique commonly used to understand product formulations and contents. The main goal of this technique is to minimize the differences between the first and last tasted samples to obtain the most accurate data (Brown & Smith, 2020).

These two methods are frequently used in the food industry for processes such as product development, quality control, and designing products that meet consumer demands (Heymann, H. 2019; White, 2021). By employing these strategies, the reliability and impartiality of the data are ensured, thereby enhancing the scientific validity of the research (Stolzenbach et al., 2013).

Critical decisions should be made during the execution of sensory analyses, such as determining the participant profile, the number of products to be tested, and selecting test methods that align with the research objectives. In this context, factors such as the preferred test method in sensory analyses, the

type of panel used, the number of panelists, sample size, and data analysis approach are detailed in Table 1.

Within the scope of this study, the hedonic test method was adopted as the preferred methodology. The hedonic test method is a widely used approach to assess consumers' perceived taste, appearance, and overall likability of products. This method serves the purpose of measuring consumers' emotional and sensory responses to products.

The selection of the hedonic test method was made in accordance with the objectives of the study and the specific requirements of the data collection process. These decisions are crucial to enhancing the reliability of the research and ensuring the scientific validity of the results.

**Table 1.** Sensory Analysis Test Shape and the panelist to the number of The According Analysis Status

| The Test Pattern | Of The Panel Type and The Number of Panelists | Sample Number | Sample Data Analysis S. |
|---|---|---|---|
| Hedonic | Semi-Trained (8-25), Untrained (80+) | 1-18 | Of Variance Analysis or Rank Analysis |

**Source:** (Enes et al., 2022: 253).

The necessary ethical approval for the research was granted by the Mersin University Social Sciences Ethics Committee on April 5, 2024 (Decision No: 120).

## 4. Results

Sensory evaluations results based on as, three different new generation brewing method with prepared coffee, a sequence of mean with standard deviation values to determine, in order, Friedman S test was applied. The results, different brewing methods, prepared and prepared the coffee flavor in terms of statistically as significant a difference that showed revealed is. For this reason, different brewing methods, with the hand of the coffees between the flavor differences of more detailed a way to examine in order Wilcoxon marked sequence test were used to.

Coffee, K40 (Chemex), K62 (V60) and K74 (Syphon) , such as codes represented have been and tested have been. Sensory criteria of the frequency analysis of the results, Table 2 detailed as presented. These results, of coffee sensory characteristics of different brewing methods in statistical as significant that the shows. Tfor template according; the generated averages comparison in terms of Figure 1 is a radar system is illustrated.
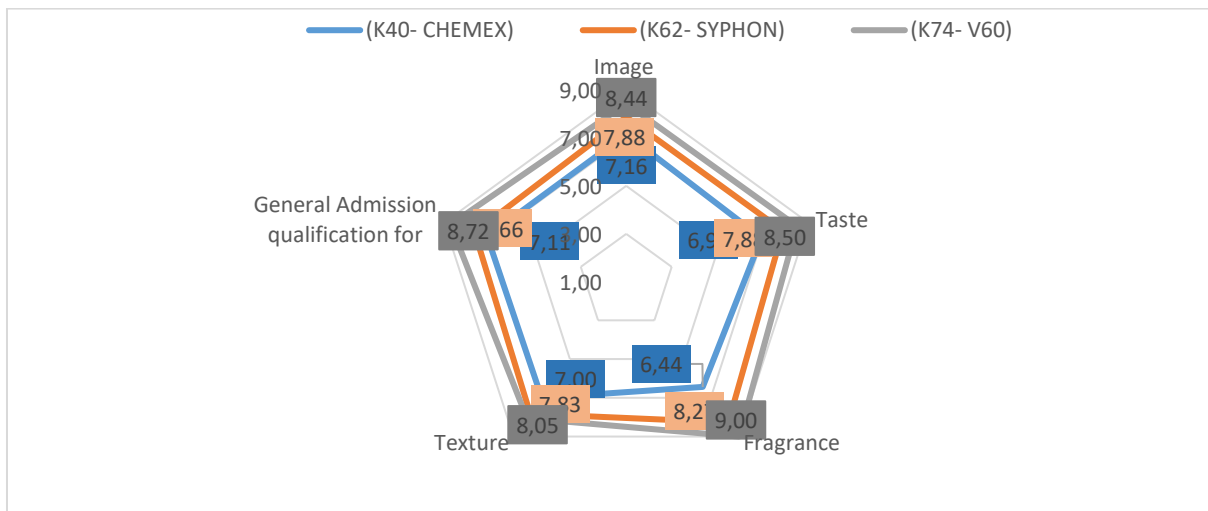


**Figure 1.** Sensory Qualities of Averages

Image in terms ofthe V60 average 8.44 points while, syphon average 7,88 points and chemex average 7.16 points obtained have been. Tat in terms of V,60 average 8.50 points while, syphon average 7.88 points and chemex average 6.94 points obtained have been. Fragrance in terms of when examined, V60 average 9.00 points while, syphon average 8.27 points and chemex average 6.44 points obtained have been. Texture apee from when evaluated, V60 average 8.05 points, while, syphon average 7.83 points and chemex on average 7.00 points obtained have been. Recent as of, general admission for the qualification in termsof the V60 average 8.72 points, while, syphon average looks up 7.66 points and chemex average 7.11 points in the form of, were evaluated. These results, in the coffee, different brewing techniques of sensory properties on significant an influence that suggests.

**Table 2.** Sensory criteria of the frequency analysis of the findings (N=18 people)

| | The Average | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|
| **(**K40 - CHEMEX**)** | | | | |
| Image | 7.16 | 0.61 | 6 | 8 |
| Taste | 6.94 | 0.93 | 5 | 8 |
| Fragrance | 6.44 | 0.70 | 5 | 8 |
| Texture | 7.00 | 0.48 | 6 | 8 |
| General Admission qualification for | 7.11 | 0.32 | 7 | 8 |
| **(**K62 - SYPHON**)** | | | | |
| Image | 7.88 | 0.32 | 7 | 8 |
| Taste | 7.88 | 0.67 | 7 | 9 |
| Fragrance | 8.27 | 0.57 | 7 | 9 |
| Texture | 7.83 | 0.92 | 6 | 9 |
| General Admission qualification for | 7.66 | 0.76 | 6 | 9 |
| (K74 - V60) | | | | |
| Image | 8.44 | 0.61 | 7 | 9 |
| Taste | 8.50 | 0.51 | 8 | 9 |
| Fragrance | 9.00 | 0.00 | 9 | 9 |
| Texture | 8.05 | 0.41 | 7 | 9 |
| General Admission Qualification For | 8.72 | 0.46 | 8 | 9 |

Sensory criteria, according statistically different coffee brewing methods available to consumers in three different prepared for the determination of whether Friedman test was used. According to the test results; in terms of the image V60 (8.44) and syphon (7,88) both chemex (7.16) with steeped coffee were found to be better. The result of image analysis in three coffees a statistically significant difference between the assessments was detected (p<0.05). The Friedman test the findings of the analysis are given in Table 3 below.

**Table 3.** Prepared with three different coffee brewing methods in image in terms of the criteria, findings from the analysis the friedman test

| | Q. That | Average | S. S |
|---|---|---|---|
| K40- Chemex | 1.28 | 7.16 | 0.61 |
| K62 - Syphon | 2.08 | 7.88 | 0.67 |
| K74 - V60 | 2.64 | 8.44 | 0.61 |
| **Friedman Test Statistic** | | | |
| N | | 18 | |
| Chi-Square | | 23.346 | |
| Df | | 2 | |
| Asymp. Shallow | | .000 | |

This difference between groups for the determination of in which the Wilcoxon Indicationtli test are reviewed. Test according to the results; in terms of the image all the coffees (K40 K62, and with K74 K40 K K6274) between their sensory criteria in significant showed a difference (p<0.05). Wilcoxon signed rank test analysis of the findings of Table 4are given in below.

**Table 4.** Prepared with three different coffee brewing methods ın terms of ımage findings from the analysis the wilcoxon signed rank test criteria

| Image K40-K62 | N | S. O | Cumulative Frequency | Z | P |
|---|---|---|---|---|---|
| Negative Sequence | 0 | .00 | .00 | -3.357 | .001 |
| - Positive As Well As | 12 | 6.50 | 78.00 | | |
| Equal | 6 | | | | |
| Total | 18 | | | | |
| **Images K40-K74** | | | | | |
| Negative Sequence | 0 | .00 | .00 | -3.416 | .001 |
| Positive Sequence | 14 | 7.50 | 105.00 | | |
| Equal | 4 | | | | |
| Total | 18 | | | | |
| **Images K62-K74** | | | | | |
| Negative Sequence | 1 | 5.50 | 5.50 | -2.673 | .008 |
| - Positive As Well As | 10 | 6.05 | 60.50 | | |
| Equal | 7 | | | | |
| Total | 18 | | | | |

Sensory criteria, according to the profile in terms of taste, prepared with three different coffee brewing methods available to consumers to determine whether there is a statistically significant difference, Friedman reviewed the test. According to the test results; in terms of taste V60 (8.50) and syphon (7,88) both chemex (6.94) with steeped coffee were found to be better. The result of analysis between three coffees taste evaluations in a statistically significant difference was detected (p<0.05). The Friedman test the findings of the analysis in Table 5below are given.

**Table 5.** The method of brewing in the coffee prepared by three different criteria in terms of the taste, the Friedman test findings from the analysis

| | Q. That | Average | S. S |
|---|---|---|---|
| K40- Chemex | 1.39 | 6.94 | 0.93 |
| K62 - Syphon | 1.92 | 7.88 | 0.67 |
| K74 - V60 | 2.69 | 8.50 | 0.51 |
| **Friedman Test Statistic** | | | |
| N | | 18 | |
| Chi-Square | | 19.964 | |
| Df | | 2 | |
| Asymp. Shallow | | .000 | |

The taste profile of this difference among the groups in terms of which is to determine which of the Wilcoxon signed rank test were reviewed. According to the test results; all the coffees in terms of taste (K62 with K40, K40 and with K74 K74 with K62) between sensory own criteria showed significant differences (p<0.05). Wilcoxon signed rank test analysis of the findings of Table 6' also are given.

**Table 6.** The method of brewing ın the coffee prepared by three different criteria in terms of the taste of findings from the analysis the wilcoxon signed rank test

| Taste K40-K62 | N | S. O | Cumulative Frequency | Z | P |
|---|---|---|---|---|---|
| Negative Sequence | 3 | 4.00 | 12.00 | -2.601 | .009 |
| Positive Sequence | 11 | 8.45 | 93.00 | | |
| Equal | 4 | | | | |
| Total | 18 | | | | |
| **K40 Taste-K74** | | | | | |
| Negative Sequence | 0 | .00 | .00 | -3.332 | .001 |
| Positive Sequence | 14 | 7.50 | 105.00 | | |
| Equal | 4 | | | | |
| Total | 18 | | | | |
| **K62 Taste-K74** | | | | | |
| Negative Sequence | 0 | .00 | .00 | -3.317 | .001 |
| - Positive As Well As | 11 | 6.05 | 66.00 | | |
| Equal | 7 | | | | |
| Total | 18 | | | | |

Sensory criteria in terms of the profile according fragrance, prepared with three different coffee brewing methods available to consumers to determine whether there is a statistically significant difference, Friedman reviewed the test. According to the test results; in terms of smell V60 (9.00) and syphon (8.27) both chemex (6.44) with steeped coffee were found to be better. A statistically significant difference was detected between the three coffees a result of analysis in odour assessments (p<0.05). The Friedman test the findings of the analysis in Table 7, are given.

**Table 7.** Prepared by the method of brewing coffee ın three different criteria in terms of smell, the Friedman test findings from the analysis

| | Q. That | Average | S. S |
|---|---|---|---|
| K40- Chemex | 1.06 A | 6.44 | 0.70 |
| K62 - Syphon | 2.11 | 8.27 | 0.57 |
| K74 - V60 | 2.83 | 9.00 | 0.00 |
| **Friedman Test Statistic** | | | |
| N | | 18 | |
| Chi-Square | | 32.375 | |
| Df | | 2 | |
| Asymp. Shallow | | .000 | |

Odor profile to determine which is which among the groups in terms of this difference, Wilcoxon signed rank test were reviewed. According to the test results; in terms of all the coffees smell (K62 with K40, K40 and with K74 K74 with K62) between sensory own criteria showed significant differences (p<0.05). Wilcoxon signed rank test analysis of the findings of Table 8 are given.

**Table 8.** Prepared by the method of brewing coffee ın three different smell criteria in terms of findings from the analysis the wilcoxon signed rank test

| Fragrance K40-K62 | N | S. O | Cumulative Frequency | Z | P |
|---|---|---|---|---|---|
| Negative Sequence | 0 | .00 | .00 | -3.598 | .000 |
| Positive Sequence | 16 | 8.50 | 136.00 | | |
| Equal | 2 | | | | |
| Total | 18 | | | | |
| **Fragrance K40-K74** | | | | | |
| Negative Sequence | 0 | .00 | .00 | -3.804 | .000 |
| Positive Sequence | 18 | 9.50 | 171.00 | | |
| Equal | 0 | | | | |
| Total | 18 | | | | |
| **Fragrance K62-K74** | | | | | |
| Negative Sequence | 0 | .00 | .00 | -3.357 | .001 |
| - Positive As Well As | 12 | 6.05 | 78.00 | | |
| Equal | 6 | | | | |
| Total | 18 | | | | |

Sensory criteria in terms of the profile according to tissue, prepared with three different coffee brewing methods available to consumers to determine whether there is a statistically significant difference, Friedman reviewed the test. According to the test results; in terms of smell V60 (8.05) and syphon (7.83) both chemex (7.00) with steeped coffee were found to be better. A statistically significant difference was detected between the three coffees a result of analysis in odour assessments (p<0.05). The Friedman test the findings of the analysis Table 9' is also given.

**Table 9.** Prepared with three different coffee brewing methods tissue criterion in terms of the findings from the analysis the Friedman test

| | Q. That | Average | S. S |
|---|---|---|---|
| K40- Chemex | To 1.28 | 7.00 | 0.48 |
| K62 - Syphon | 2.25 | 7.83 | 0.92 |
| K74 - V60 | 2.47 | 8.05 | 0.41 |
| **Friedman Test Statistic** | | | |
| N | | 18 | |
| Chi-Square | | 17.433 | |
| Df | | 2 | |
| Asymp. Shallow | | .000 | |

Odor profile to determine which is which among the groups in terms of this difference, Wilcoxon signed rank test were reviewed. According to the test results; in terms of smell with K62 K40, K40 own with K74 between sensory criteria showed significant differences (p<0.05). K62 but with no significant difference in texture between themselves did not show K74. Wilcoxon signed rank test analysis of the findings in Table 10' also are given.

**Table 10.** Prepared with three different coffee brewing methods tissue criterion in terms of findings from the analysis the Wilcoxon signed rank test

| Tissue K40-K62 | N | S. O | Cumulative Frequency | Z | P |
|---|---|---|---|---|---|
| Negative Sequence | 3 | 8.83 | From 26.50 | -2.456 | .004 |
| Positive Sequence | 14 | From 9.04 | 126.50 | | |
| Equal | 1 | | | | |
| Total | 18 | | | | |
| **K40 Tissue-K74** | | | | | |
| Negative Sequence | 1 | 7.50 | 7.50 | -3.497 | .000 |
| Positive Sequence | 16 | 9.09 | 145.50 | | |
| Equal | 1 | | | | |
| Total | 18 | | | | |
| **K62 Tissue-K74** | | | | | |
| Negative Sequence | 3 | 3.50 | 10.50 | -1.100 | .271 |
| Positive Sequence | 5 | 5.10 | 25.50 | | |
| Equal | 10 | | | | |
| Total | 18 | | | | |

Sensory criteria according to general admission for the qualification in terms prepared with three different coffee brewing methods available to consumers to determine whether there is a statistically significant difference, Friedman reviewed the test. According to the test results; general admission for qualification in terms V60 (8.72) and syphon (looks up 7.66) both chemex (7.11) with steeped coffee were found to be better. A statistically significant difference was detected between the three coffees a result of analysis in odour assessments (p<0.05). The Friedman test the findings of the analysis Table 11are given below.

**Table 11.** Prepared with three different coffee brewing methods General Acceptance Edilebilirlik criteria in terms of the findings from the analysis the Friedman test

| | Q. That | Average | S. S |
|---|---|---|---|
| K40- Chemex | To 1.28 | 7,11 | 0,32 |
| K62 - Syphon | 1.86 | 7,66 | 0,76 |
| K74 - V60 | 2.86 | 8,72 | 0,46 |
| **Friedman Test Statistic** | | | |
| N | | 18 | |
| Chi-Square | | 25.182 | |
| Df | | 2 | |
| Asymp. Shallow | | .000 | |

General admission qualification for this difference among the groups in terms of which is to determine which of the Wilcoxon signed rank test were reviewed. According to the test results; general admission for the qualification in terms of all the coffees (K62 with K40, K40 and with K74 K74 with K62) between sensory own criteria showed significant differences (p<0.05). Wilcoxon signed rank test analysis of the findings in Table 12are given below.

**Table 12.** Prepared with three different coffee brewing methods at general admission qualification for the criteria ın terms of the findings from the analysis the Wilcoxon signed rank test

| General Admission Qualification For **K40-K62** | N | S. O | Cumulative Frequency | Z | P |
|---|---|---|---|---|---|
| Negative Sequence | 2 | 8.75 | 17.50 | -2.066 | .039 |
| Positive Sequence | 11 | 6.68 | 73.50 | | |
| Equal | 5 | | | | |
| Total | 18 | | | | |
| General Admission Qualification For **K40-K74** | | | | | |
| Negative Sequence | 0 | .00 | .00 | -3.787 | .000 |
| Positive Sequence | 17 | to 9.00 | 153.00 | | |
| Equal | 1 | | | | |
| Total | 18 | | | | |
| General Admission Qualification For **K62-K74** | | | | | |
| Negative As Well As | 2 | 7.50 | 15.00 | -3.252 | .001 |
| - Positive As Well As | 16 | 9.75 | 156.00 | | |
| Equal To | 0 | | | | |
| And a Total of | 18 | | | | |

## 4. Results and Discussion

This study aimed to assess the sensory attributes associated with third-wave coffee brewing methods, such as Chemex, V60, and Syphon. The results indicated statistically significant discrepancies in sensory experiences when identical coffee types were prepared using different brewing methods. Specifically, coffee prepared using the V60 method consistently received higher ratings in terms of visual appeal, taste, aroma, and texture compared to other brewing methods. These findings corroborate those of Kement et al. (2022), who examined consumer sensory evaluations of third-generation coffee brewing methods employing six different techniques. The study highlighted the V60 method's superior performance in terms of taste and aroma perception, aligning with the outcomes of our investigation. These results underscore the substantial impact of coffee brewing methods on the sensory profile of the final brew.

The perceived superiority of the V60 method may be attributed to its ability to deliver a more holistic and enhanced coffee experience across various sensory dimensions. This suggests that the V60 method might facilitate more efficient extraction of coffee flavors and essences, thereby ensuring a consistently high-quality brewing process. However, it is important to acknowledge that variations in brewing processes, as observed in methods like Chemex and Syphon, could potentially influence the sensory properties of the resulting coffee.

Nevertheless, it is pertinent to acknowledge the limitations of this study, including its focus solely on third-wave coffee brewing techniques and the relatively limited participant pool. Therefore, conducting larger-scale studies encompassing a broader spectrum of brewing methods is essential to obtain more comprehensive insights into the nuances of coffee sensory profiles.

The findings of this study hold significant implications for product development and marketing strategies within the coffee industry. Emphasizing more effective brewing methods like the V60 could enhance consumer experiences and satisfaction, thereby potentially bolstering brand loyalty and market competitiveness. Additionally, further research aimed at better understanding the effects of coffee consumption on sensory perceptions is warranted. Such endeavors could delve into the intricacies of coffee brewing techniques in greater detail and facilitate a deeper understanding of consumer preferences.

In conclusion, coffee brewing methods play a pivotal role in shaping product quality and consumer satisfaction within the coffee industry. These findings underscore the importance of continued research in this area, which may contribute to the advancement and innovation of the coffee industry.

### 4.1. Theoretical Implications

This study aimed to evaluate the sensory attributes associated with third-wave coffee brewing techniques, presenting a specific comparison that distinguishes it from previous similar research. While prior studies have generally examined coffee brewing methods, this research specifically delved into the impact of specific brewing techniques on the sensory profile of coffee. The selection of coffees included in the evaluation was determined through consultations with employees from five different coffee establishments. Thus, three distinct brewing methods, namely Chemex, V60, and Siphon, were tested and compared in terms of their effects on the appearance, taste, aroma, texture, and overall acceptability levels of coffee. From this perspective, the study represents a pioneering effort within the coffee industry. This unique approach holds the potential to provide valuable insights into consumer preferences and product development strategies related to coffee brewing techniques.

### 4.2. Practical Implications

The practical implications of this research signal a period of transformation and innovation in the coffee industry. The focus on third-wave coffee brewing techniques presents a significant opportunity for players in the sector. Particularly, the findings of this study allow coffee businesses to delve deeply into product development and marketing strategies.

On one hand, the emphasis on specific brewing methods such as the V60 could redefine the coffee experience and enable brands to gain a unique competitive advantage. By focusing more on consumers' sensory preferences, the coffee industry can sustain growth by offering premium products and enhancing customer satisfaction.

On the other hand, coffee businesses and equipment manufacturers can better understand consumers' expectations and provide products and services tailored to these expectations using the findings of this research. With a customer-centric approach, it may be possible to better understand market segmentation and provide customized solutions to the target audience.

This study also serves as a guide to optimize the coffee experience and raise industry standards. By focusing on product quality and customer satisfaction, the coffee industry can increase its loyal customer base and strengthen its position as a leader in the sector by offering consumers a unique and unforgettable experience.

In conclusion, the findings of this study provide a new perspective to the coffee industry and encourage innovative steps in the sector. With further in-depth research and applied studies, these findings could shape the future of the coffee industry and initiate significant transformation within the sector.

### 4.3. Limitations and Future Research
This study has extensively examined the sensory characteristics of third-wave coffee brewing methods in a detailed manner. However, there are some limitations of the research and points to consider for future research recommendations:

• Participant Number and Diversity: The study noted a limited number of participants. Using a larger sample size and increasing demographic diversity could enhance the generalizability of the results. For instance, studies involving participants from different age groups and cultural backgrounds could diversify the findings.

• Diversity of Brewing Methods: The research only investigated three different brewing methods. Future research could explore a wider range of brewing techniques, particularly studies

involving a combination of traditional and new methods. This could provide a better understanding of coffee's sensitivity to different brewing methods.

- Examination of Effects on Marketing and Consumer Preferences: The research solely focused on sensory characteristics. Future studies could examine the effects of different brewing methods on consumer preferences, purchasing behaviors, and the marketing strategies of coffee brands. This could contribute to a better understanding of the coffee industry and the development of businesses' strategies.
- Expansion of Application Areas: This research was conducted in a coffee business in Mersin. Future studies could increase the generalizability of the results by conducting similar analyses in different geographical regions, various coffee cultures, and different consumer segments.

These recommendations could assist future research in obtaining more comprehensive, wide-ranging, and meaningful results. Consequently, it may be possible to improve the quality of the coffee industry and develop more effective strategies to provide consumers with a better experience.

**Research and Publication Ethics Statement**

This study has been prepared in accordance with the ethical principles of scientific research and publication, as per the decision numbered 120 dated 5.4.2024 of the Mersin University Social and Human Sciences Ethics Committee.

**Contributions of Authors to the Manuscript**

The contribution of the first author to the manuscript is 60%, while the contribution of the second author is 40%.

**Support Statement**

This study has not received any support from any institution or organization.

**Conflict of Interest Statement**

There are no financial or non-financial conflicts of interest among the authors involved in this study.

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