EVALUATION OF CONSUMERS' PERCEPTION OF A RED BLEND WINE: A CASE STUDY IN BIHOR COUNTY

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RESEARCH ARTICLE

Abstract

Sensory evaluation is an essential tool for assessing wine quality, as it integrate perception related to color, aroma, taste, aftertaste and overall impression, providing a synthetic product acceptability. The present study aims to evaluate a red blend wine (Merlot-Cabernet-Pinot), conducted during a public event organized in Oradea, a cumulative scoring grid that included five dimensions: color, aroma, taste, aftertaste, and overall impression.

Overall, the evaluation indicated a favorable perception of the wine and a high level of acceptability. The interpretation of responses suggest that the olfactory and gustatory dimensions played a decisive role in shaping the overall judgment, while the variation in scores reflects both the profile of the untrained panel and the specific context of a public tasting event. These findings support the need to standardize testing conditions and to replicate the evaluation across different batches/years in order to strengthen the conclusions and ensure a more robust validation of perceived quality.

Keywords: sensory evaluation; red wine; untrained panel; acceptability

INTRODUCTION

Wine is one of the oldest fermented products with cultural, economic, and sensory factors. From the consumer's perspective, purchase decisions and satisfactions levels are strongly influenced by characteristics such as aroma, taste, structure (including astringency), and the persistence of the aftertaste, while color provides preliminary cues regarding the typology and evolution of the wine (Waterhouse, 2018; Bruwer et. al., 2011).

Current trends in the wine market indicate an increasing orientation toward authentic products with regional identity and a well-defined sensory profile. Modern consumers no longer choose wine solely based on price, but also according to the experience it offers, its taste balance, and the story behind the product. Recent studies show that intrinsic cues, taste, aroma, clarity and color are the main criteria in wine selection, especially for experienced consumers.

Sensory evaluation is a tool used both for quality control and for product positioning on the market, as it enables the integration of overall perception into a set of quantifiable attributes. The literature emphasizes that aromatic intensity and gustatory components (alcohol-acidity-tannin balance) significantly influence the final judgment of tasters, particularly in the case of red wines (Culleré et al., 2007). At the same time, differences between trained and untrained panels are methodologically relevant: untrained panels tend to evaluate more "hedonically" (based on pleasure/acceptability), and intra-group variability is often higher, requiring careful statistical reporting and the standardization of tasting conditions (ISO, 2023).

Specific objectives:
(i) to estimate the level of acceptability (total score) and describe the distribution of scores;
(ii) to identify the attributes with greater weight in the total score;
(iii) to discuss the results in relation to methodological benchmarks from the specialized literature, with emphasis on the particularities of an untrained panel.

LITERATURE REVIEW

Numerous studies highlight that sensory perception decisively influences purchase decisions and loyalty toward a brand or wine region (Bruwer et al., 2011; Ducman, 2024), which is why the use of sensory analysis supports product classification, quality control,

the development of new wine types, and the study of consumer preferences.

The sensory quality of wine is determined by the interaction between volatile compounds (responsible for aroma) and non-volatile compounds (polyphenols, acids, sugars, alcohol), which influence taste, texture, and aftertaste (Culleré et al., 2007). Visual attributes play the role of a "first impression," and in the case of red wines, color is associated with the composition and evolution of pigments (anthocyanins) and their interactions with tannins processes that are relevant for color stability over time (Picariello et al., 2017).

Regarding consumer behavior, studies show that preferences and evaluations may vary depending on consumption experience and socio-demographic characteristics, with direct implications for purchasing decisions (Bruwer et al., 2011). Methodologically, standards concerning the selection and training of evaluators (for trained/expert panels) emphasize the importance of controlling testing conditions and tasters' competencies issues that become critical when untrained panels are used, where response variability is expected (ISO, 2023).

Sensory evaluation of wine is used to describe and quantify perceptions related to visual, olfactory, and gustatory attributes, providing a synthesis of the quality perceived by consumers. In the case of red wines, the usual dimensions assessed include color, aroma, taste, aftertaste, and overall impression, each influenced by chemical composition and complex sensory interactions (Sáenz-Navajas et al., 2020; Ballester et al., 2024).

Color is the first attribute observed and can provide clues about the wine's composition and evolution. Intensity and hue are mainly associated with anthocyanins and their interactions with tannins, while color stability depends on copigmentation and polymerization reactions that lead to more stable pigments over time (Butzke, 2012; Waterhouse et al., 2016). Beyond its informative role, visual cues may induce a "halo effect," influencing expectations and even the descriptors reported for aroma and taste, indicating that evaluation is not entirely independent across senses (Nguyen & Durner, 2024; Morrot et al., 2001).

Wine aroma and bouquet derive from a mixture of volatile compounds originating from grapes, fermentation, and maturation, generating fruity, floral, vegetal, or spicy notes (Ferreira et al., 2006; Fan et al., 2023). Traditionally, aromas are grouped into primary (varietal), secondary (fermentative), and tertiary (maturation) aromas, and recent literature highlights the major role of microorganisms and technological choices in shaping the aromatic profile (Du et al., 2024; He et al., 2023).

Taste and mouthfeel result from the balance between acidity, alcohol, tannins, and sugars, complemented by non-volatile compounds (polyphenols, glycerol, polysaccharides) that influence texture and astringency (Ballester et al., 2024). The literature shows that taste perception is closely linked to smell through multisensory integration, meaning that aroma can modify the perception of taste and tactile sensations, while structural balance is an important predictor of perceived quality (Sáenz-Navajas et al., 2020; Bastian & Collins, 2019).

Aftertaste (aromatic persistence) is frequently associated with high-quality wines and is defined by the duration and complexity of sensations after swallowing. Persistence depends on phenolic structure and tannin integration, and the degree of their polymerization may influence the duration of astringent perception and quality scores (McRae & Kennedy, 2011; Piombino et al., 2020; He et al., 2023). Consequently, aftertaste functions as a "summary" of the balance among aroma, structure, and wine texture.

In current research, there is a consolidation of approaches that correlate sensory data with chemical composition and microbiological processes, including the use of multivariate analysis and modeling tools (Pineau et al., 2021; Urtasun et al., 2022). These directions support the idea that the sensory profile cannot be explained by a single compound, but rather by interactions among classes of compounds and the perceptual context, which justifies the use of sensory evaluation as a complementary tool to chemical analyses (Sáenz-Navajas et al., 2020; Ballester et al., 2024).

Recent studies confirm that climate change influences sugar accumulation, acidity, and the phenolic composition of grapes, thereby implicitly modifying the sensory balance of wines (Van Leeuwen & Destrac-Irvine, 2017; Morales-Castilla et al., 2020). At the same time, the integration of artificial intelligence in sensory data analysis enables modeling the relationship between chemical composition and consumer preferences, offering useful

predictive tools for the wine industry (Pereira et al., 2023; Urtasun et al., 2022).

Furthermore, the literature highlights an increasing orientation toward wines with regional identity (terroir), sustainable wines, and authentic wines that reflect the specific characteristics of the wine-growing area. Recent research on the concept of terroir emphasizes the importance of the interaction between soil, climate, and microbiome in defining wine typicity (Bokulich et al., 2016; Van Leeuwen et al., 2018). At the same time, interest in sustainability is associated with changing consumer preferences toward products perceived as natural and environmentally responsible (Galati et al., 2019).

MATERIAL AND METHOD

The study is observational, consisting of a single sensory evaluation conducted during a public event organized in Oradea (Romania). The assessment took place in a non-laboratory setting, typical of public tastings, which implies a lower level of control over environmental factors.

The analyzed product was a red blend wine (Merlot–Cabernet–Pinot), identified in the evaluation sheet as a single sample (UO). As this was a public tasting, the product was evaluated as such, without direct comparison to other wines within the same session.

The panel included 36 participants (N = 36), considered untrained (without formal training in sensory analysis and without certified expert status). Participation was voluntary, and responses were collected anonymously and statistically aggregated.

An evaluation sheet with a cumulative maximum score of 15 points was used, divided into five dimensions:

- Color (0–2 points)
- Aroma (0–3 points)
- Taste (0–5 points)
- Aftertaste (0–3 points)
- Overall impression (0–2 points)

The total score was obtained by summing the points for each dimension. (The dataset also includes decimal values for "aroma," indicating the use of intermediate gradations when completing the evaluation sheet for this attribute.)

The data were analyzed descriptively using mean, standard deviation, minimum–maximum values, and quartiles. To explore the contribution of each attribute to the total score, correlations (Pearson and Spearman) were calculated between the total score and each individual attribute.

RESULTS AND DISCUSSIONS

The sensory evaluation was conducted using an untrained panel (N = 36), applying a cumulative 15-point scoring grid that integrated five dimensions: color, aroma, taste, aftertaste, and overall impression. As the panel did not receive formal training, the scores primarily reflect acceptability and perceived quality under public tasting conditions, and variability among participants is considered an expected outcome in this type of design (ISO, 2023).

Table 1 presents the individual scores assigned to the UO wine for each attribute, as well as the total score obtained by summation, providing a basis for interpreting the distribution of evaluations and identifying the dimensions with a greater contribution to the overall assessment.

Results of the sensory evaluation for the UO wine (Merlot-Cabernet-Pinot, 2024, Oradea)

Nr. crt.	Color	Aroma	Taste	Aftertaste	Overall impression	Total Score
1	2	2	5	2	2	13
2	2	1	3	2	1	9
3	1	2	4	2	2	11
4	2	2	3	3	1	11
5	1	2	4	2	1	10
6	1	2	3	2	2	10
7	2	2	4	3	2	13
8	2	3	5	3	2	15
9	2	3	5	3	2	15
10	1	3	4	1	2	11
11	2	1	4	3	2	12
12	2	2	4	2	2	12
13	2	2	3	2	2	11
14	1.7	2.5	3.5	2.4	1.7	11.8
15	2	1	5	3	2	13

16	2	3	4	2	2	13
17	2	3	5	3	2	15
18	2	2	4	2	2	12
19	2	3	3.5	2	2	12.5
20	2	3	4	3	2	14
21	2	2	4	3	2	13
22	1	2	5	2	1.5	11.5
23	2	3	4	3	2	15
24	2	2	3	2	1	10
25	2	3	4	2	2	13
26	1	0.5	3	1	1.5	7
27	2	3	4	3	2	14
28	2	2	4	3	2	13
29	2	3	5	3	2	15
30	1	2	4	3	2	12
31	2	3	5	3	2	15
32	2	2	4	1	2	11
33	1	2	4	2	2	12
34	2	1	2	2	2	9
35	2	3	5	3	2	15
36	2	2	3	2	1	10

Descriptive statistics

Indicator	Color	Aroma	Taste	Aftertaste	Overall Impression	Total Score
Average	1.77	2.22	3.97	2.37	1.83	12.22
Total	63.7	80	143	85.4	65.7	439.8

Regarding the level of acceptability and score dispersion, the total scores from Table 1 range between 7 and 15 points, with a mean of 12.22 and moderate dispersion (SD ≈ 2.01). The distribution confirms a generally favorable evaluation: approximately 47.22% of participants awarded scores in the 13–15 range, 44.44% in the 10–12 range, and only 8.33% rated the wine below 10 (≤9). This structure indicates high acceptability at the sample level and suggests that negative perceptions were in the minority.

Looking at the attributes with higher average scores, the hierarchy is as follows:

- **Taste:** mean ≈ 3.97/5 – the attribute with the greatest weight in the total score; it indicates a flavor profile perceived as balanced and pleasant by most participants.
- **Aftertaste:** mean ≈ 2.37/3 – suggests good aromatic persistence and a positively appreciated finish.
- **Aroma:** mean ≈ 2.22/3 – an important contributor to the overall evaluation; fractional values (e.g., 0.5) indicate that participants used intermediate gradations, providing finer resolution on the aroma scale.
- **Color:** mean ≈ 1.77/2 – most scores are 2; low variability (ceiling effect) suggests that the visual aspect was consistently well appreciated.
- **Overall impression:** mean ≈ 1.83/2 – also shows a ceiling effect (many scores of 2), confirming a generally positive global evaluation.

The combination of **taste–aroma–aftertaste** demonstrates that taste received the highest scores, while aroma and aftertaste were also high, indicating a sensory profile perceived as pleasant across the full experience (olfactory–gustatory–retronasal). In tastings focused on acceptability (untrained panels), these three dimensions are typically the most influential on the total score, whereas color serves as an initial cue (important but less decisive for differentiation once it is already well-rated by the majority).

Differences between individuals are also observed. These arise from the untrained panel (different sensitivity thresholds, varied consumption experience, differing

expectations) and the public context (reduced control over environmental factors). Standards for sensory evaluation highlight that, in the absence of formal training, variability is more likely and should be interpreted as part of the acceptability phenomenon (ISO, 2023).

Figure 1 suggests that taste has the greatest weight in the average evaluation, followed by **aroma** and **aftertaste**, indicating that the overall appreciation is primarily built through the olfactory–gustatory experience and the persistence of sensations after swallowing. This configuration is consistent with multisensory approaches to wine experience, which emphasize that quality judgment results from the simultaneous integration of the senses, and that aroma (including retronasal perception) can enhance the evaluation of taste and tactile sensations, directly contributing to the overall impression (Campo et al., 2021).

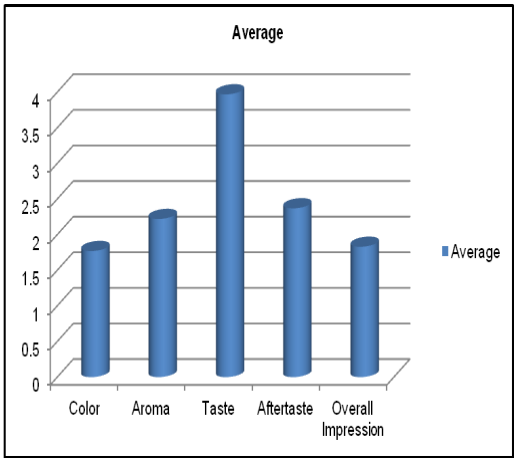

Figure 1. Average of the total scores for the sensory atributions

Specifically for red wines, **aftertaste** is often associated with phenolic structure and with the way astringency and flavors integrate, so a more persistent and "rounded" aftertaste tends to be interpreted as an indicator of quality (Piombino et al., 2020). Furthermore, literature on aroma release during consumption shows that both the taster's physiology and the wine matrix can modulate the intensity and evolution of aromatic perception, explaining why aroma and aftertaste can strongly support overall appreciation, even when the evaluation is performed by untrained consumers (Lyu et al., 2021).

Figure 2 highlights a distribution of the total score concentrated in the upper range of the scale, suggesting **high acceptability at the sample level**, with a limited number of low ratings. Such a distribution is consistent with evaluations **conducted using untrained panels** and/or in public settings, where scores predominantly reflect preference and consumption experience, and individual variability is more pronounced than in the case of trained panels. Standards regarding the selection and training of sensory evaluators indicate that the lack of training frequently leads to greater score dispersion, due to differences in perception thresholds, sensory vocabulary, and rating stability, which makes interpretation in terms of acceptability and appropriate statistical reporting necessary (ISO, 2023). From this perspective, the concentration of scores toward higher values suggests that the wine was positively perceived by most participants, while the low scores may be attributed to individual differences or specific environmental conditions during tasting (e.g., competing olfactory stimuli), rather than to a generalized pattern of rejection.

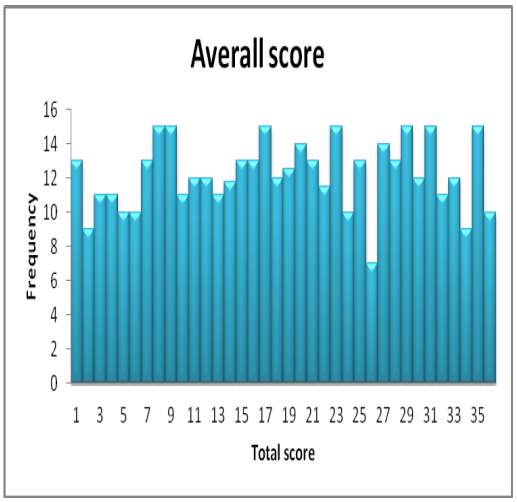

Figura 2. Distribution of the overall score

Overall, the combination **of the mean profile dominated by taste–aroma–aftertaste** (Figure 1) **and the distribution oriented toward high scores** (Figure 2) supports the conclusion that the product has good potential for consumer acceptance, and that perceived quality is primarily constructed through olfactory and gustatory components as well as aromatic persistence. At the same time, in order to increase the robustness of inferences and comparability with other studies, the literature recommends replicating the evaluation under standardized conditions and, where possible, triangulating the results with chemical measurements of aromatic compounds and/or

phenolic structure, given that perceptions are influenced by matrix effects and by the dynamics of aroma release during consumption (Lyu et al., 2021; Piombino et al., 2020).

CONCLUSIONS

The red blend wine (Merlot–Cabernet–Pinot) achieved a mean total score of **12.22 ± 2.01 (out of 15)**, indicating high acceptability among the untrained panel. The score distribution shows that 47.22% of evaluators awarded ratings in the 13–15 range, suggesting that a significant proportion of consumers perceived the product as having superior quality.

Attribute analysis highlights that **taste and aroma** were the primary determinants of the total score, consistent with the literature emphasizing the role of volatile compounds and gustatory balance in shaping perceived quality (Culleré et al., 2007). At the same time, the variability of scores is compatible with the use of an untrained panel and the organization of the tasting in a public context. This supports the need for procedural standardization and replication of the evaluation to enhance the robustness of the findings (ISO, 2023).

LIMITATIONS AND FUTURE DIRECTIONS

The study involved a single product and a single tasting session conducted in a public setting with limited environmental control. In future research, it is recommended to replicate the evaluation across different batches/vintages, include a trained panel, and complement the analysis with chemical indicators (e.g., polyphenol and volatile compound parameters) in order to triangulate the sensory findings and strengthen the robustness of the results.

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