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Mixed Profiling: A new tool of sensory analysis in a professional context. Application to wines



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ABSTRACT

“Mixed Profiling” (MP) is a descriptive profiling combining a pre-established list of descriptors scored by all tasters and the possibility for each panellist to add free descriptors. All the descriptors, free or not, are rated on an intensity scale. The aim is to improve the reliability of wine characterisation in a professional context. Quantitative Descriptive Analysis® provides a fine characterisation while free-choice profiling is a more holistic method that is easier to implement with professionals. In general, professionals are not trained together and evaluate wines using pre-defined descriptors. MP aims to combine the power of the two methods. It is compared to a classical profiling (CP) largely performed in a wine professional context that uses a pre-defined list of descriptors. Ten red wines were evaluated by two distinct panels of wine professionals without prior common training. Performances of the panel were verified using variance analysis and the results of both sensory methodologies were compared using a multi-block method. The results reveal that MP avoids the omission of a specific sensory characteristic and provides a complete sensory characterisation of products in a short time.

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1. Introduction

In the wine sector, sensory characterisation enables (i) the establishment of the sensory description of the wine flavour according to e.g. the vineyard location or the vintage; (ii) the definition of sensorial descriptors qualifying the typicality; (iii) the judgment of wine quality, especially in PDO (protected designation of origin) control; and (iv) the validation of the sensory impact of agronomic and oenological practices (Cadot, Caillé, Samson, Barbeau, & Cheynier, 2010; Lobodanin, Barroso, & Castro, 2014; Maitre, Symoneaux, Jourjon, & Mehinagic, 2010; Parpinello, Rombolà, Simoni, & Versari, 2015). In this sector, such characterisation is often carried out by professionals (e.g. oenologists, sommeliers, winemakers).

Different approaches have been used to assess the sensory characteristics of wines. Conventional profiling is often employed (Varela & Ares, 2012). One of the main contributions of this method is its ability to describe the products with a high level of precision (Murray, Delahunty, & Baxter, 2001). However, a series of steps have to be followed in order to ensure relevant results (Varela & Ares, 2012): generation of descriptors, definition of the evaluation procedure for each attribute, panellist training and then product

characterisation. The extensive training of panellists to ensure repeatability and consensus among the panel is a difficult and time-consuming task (de Cássia dos Santos Navarro da Silva et al., 2012). In a wine professional context, this method needs some adaptations because most of the time the panellists are get together only for the characterization sessions without previous common training or generation of descriptors. However, first, thanks to a common descriptive language and their significant knowledge of wine characteristics, it has been demonstrated that wine experts can perform sensory description without previous common training because they share a common descriptive language (Maitre et al., 2010). Secondly, the generation of descriptors by the panel is classically solved by the use of a list of descriptors pre-defined by the panel leader. Most of the time this list is quite short to reduce the time of the task; consequently the risk to avoid an important descriptor can be high. To clearly distinguish the two procedures, in a professional context we use the term of “classical profiling” instead of conventional profiling.

In this context, in one hand, fast methods as Check-all-that-apply (CATA) or Rate-all-that-apply (RATA) (Ares et al., 2014; Giacalone & Ingholt Hedelund, 2016) can be used. However the number of descriptors has to be limited to perform an easy task. Given the large number of descriptors that can characterize a wine, these methods may lead to the omission of some descriptors to describe accurately some wine samples that can be complex.

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In another hand, several alternative methods to the conventional profiling have also been proposed by researchers for an exhaustive sensory characterisation of wines including free-choice profiling, which was developed on wines in the 1980s by Williams and Langron and has been used on a large number of products (Gains & Thomson, 1990; Guàrdia, Aguiar, Claret, Arnau, & Guerrero, 2010; Narain, Paterson, & Reid, 2004; Perrin et al., 2008). It can be used without training the panellists together because they themselves freely generate the descriptors (Pérez Aparicio, Ángeles, Toledano, Medina, & Lafuente Rosales, 2007). This method is attractive because it is based on the construction of the panellists' own knowledge and can lead to an exhaustive characterisation, depending on the panellists' expertise. It therefore meets the need for faster methods for professional panels in the wine sector. However, its results can be difficult to interpret due to the large diversity of individual descriptors generated and the lack of decisional statistical tests (unlike in conventional profiling where an analysis of variance can be used). The aim of the present work was to develop a fast and reliable method called "Mixed Profiling" (MP) combining the advantages of both conventional profiling i.e. the precise characterisation and free choice profiling i.e. the exhaustive description. Thus, MP consists of presenting a pre-established list of descriptors to which professionals can add and rate on a scale as many descriptors as necessary to obtain a complete product description. The interest of the MP method was tested and validated comparing to a classical profiling (CP) prior to optimising it in subsequent work.

2. Materials and methods

2.1. Wines

In order to test the MP method, wines with a large sensory diversity were selected. The sampling set included 10 commercial red wines from 2 cultivars of *Vitis vinifera* (5 Cabernet Franc coded CF1 to CF5 and 5 Gamay coded Ga1 to Ga5). The Cabernet Franc wines were selected from a previous experiment (Lawrence et al., 2013) to present different flavour characteristics. The Gamay wines were selected for their sensorial diversity by two oenologists from the Loire Valley. These two experts did not participate in the following sensory evaluation. The wines came from several vintages (2006–2010) and several Protected Designations of Origin (Anjou, Touraine, Chinon and Beaujolais)

The wines were stored in a climate-controlled dark cellar maintained at 11 °C (± 1 °C). The day before the session, the wine bottles were stored at room temperature (20 °C ± 1 °C). The day of the session, the panel leader checked that the wines were free of cork taint.

2.2. Experimental conditions and general sensory procedure

The sensory sessions took place in a sensory laboratory. In order to test the reliability of the new MP method, two different panels composed of wine professionals characterised the samples. The wines (30 mL) were poured into dark INAO-approved wine glasses to eliminate visual cues as sources of information. The glasses were labelled with 3-digit codes and covered by plastic Petri dishes. The 10 wines were evaluated in duplicate (two replicates per session) based on a William Latin-square arrangement. Between each sample, the panellists were asked to eat unsalted crackers and to cleanse their mouth with mineral water (Evian, France). An interval of 15 min was imposed in the middle of the session to limit panellist fatigue. However, during the session, the panellists had the opportunity to take a break when they considered it necessary.

At the beginning of the session, the list of descriptors and the instructions for the sensory method used were presented to the panellists. Then, the tasting session took place in the same air-conditioned room (20 °C ± 1 °C) under red light in individual booths. Each panellist participated in one session. The data acquisition was performed using FIZZ software (Biosystèmes, Couternon, France).

Panellists were asked to evaluate each wine retronasally and to score the intensity of the descriptors on a 6-point scale from 0 to 5 in which 0 = 'none', 1 = 'just detectable', 2 = 'low', 3 = 'medium', 4 = 'strong', and 5 = 'extremely strong'. A discontinuous scale was chosen to be consistent with the habits of the professionals from the Loire Valley region, who use this type of scale during wine competitions and technical tastings. For each panel, the 10 wines were evaluated in duplicate, in one session.

The panellists were not previously trained together. As they are some wine professionals, as said before, they share a common descriptive language (Maitre et al., 2010). However, good panel performance was a prerequisite to compare the two methods and consequently they were verified in the first step of the data analysis.

Data were analysed using R software v. 3.1.2. The *lmerTest* (Kuznetsova, Bruun Brockhoff, & Haubo Bojesen Christensen, 2013) package was used to perform the analysis of variance. The *ade4* package (Dray, Dufour, & Chessel, 2007) was used to perform the multidimensional analysis.

2.3. Classical profiling (CP)

2.3.1. Descriptor selection of the CP

The descriptors of a CP are most of the time chosen by the panel leader or based on a tasting sheet commonly used by the oenologists. Here, the aim was to validate the interest of the MP so the selection of descriptors was made more thoughtfully. Classically in a professional context, the selection of the descriptors by the panel leader would have been faster. The aim here was to avoid the omission of some attributes to consider this method as the reference method to test de MP. A list of 26 descriptors, that is a current amount of descriptors, was generated based on (i) a previous study conducted by Lawrence et al. (2013), (ii) the descriptors usually associated with red wines from the Loire Valley, (iii) the literature (Campo, Do, Ferreira, & Valentin, 2008; Noble et al., 1984) and (iv) a survey about the odour descriptors adapted for Cabernet Franc and Gamay wines, sent by postal mail to 52 wine professionals (oenologists, wine technicians, wine researchers, winemakers, wine merchants and sommeliers; aged 20–60 years old; 42 men and 10 women). In this survey, a list of 131 odour descriptors usually associated with wines from the Loire Valley was proposed to the wine professionals. They had to check, and could add to, the most relevant descriptors to describe the aromatic expressions of Loire Valley red wines. This method is quite similar to the Check-all-that-apply (CATA) method (Meyners & Castura, 2014) but used a wide list of descriptors and only the knowledge of the professionals; they did not taste the wines. The data of this survey are not shown in this paper. The 27 wine professionals involved in this descriptor generation survey did not participate to the sensory sessions.

The 26 selected descriptors were assessed in the order presented in Table 1. The terms were arranged according to the following categories: fruity, floral, vegetal, spicy, empyreumatic, undergrowth, animal, woody, fermented and reduction, which are classic aroma families in wine (Noble et al., 1984). The fruit family was subdivided into 10 subcategories (e.g. red fruits, black fruits, citrus fruits, etc.).

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