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Comparison of three sensory methods for use with the Napping® procedure: Case of ten wines from Loire valley

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Abstract

In the wine industry, characterisation is usually performed by wine professionals. However, the methods classically used in sensory analysis appear to be little adapted to this type of jury: winemakers are not unavailable per se but often not suitable as sensory panellists for extended studies by researchers. A method called Napping® was developed recently. This method seems to be more relevant to the wine profession because of its spontaneous aspect and its flexibility. However, Napping® itself does not characterise the products and has to be completed with a descriptive method. The aim of this study was to compare three methods to complete a wine Napping®: a conventional profile, taken as reference, and two simplified profiles (ultra-flash profile, UFP, and free profile, FP). Data were treated by hierarchical multiple factor analysis. Results show that all methods underlined the same main characteristics. The data collection from UFP is partly arbitrary, but this method is the least time-consuming and easily provided wine characterisations. It appeared here to be a good complement to Napping® and to be well adapted to wine professionals when a rough description is expected.
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Keywords: Napping; Free profiling; Ultra-flash profiling; Wine characterisation; Hierarchical multiple factor analysis

1. Introduction

In the wine industry, product characterisation is usually performed by wine professionals and their judgment is taken as a reference. However, the methods classically used in sensory analysis (such as conventional profiling) require an intensive training and can thus not be applied to a panel of wine professionals because of their poor availability. Moreover, in the case of conventional profiling, the importance of the different attributes in the overall perception of judges is not known. In order to take a better account of the individual perception, a new method, called Napping®, was developed recently (Pagès, 2003, 2005a). It allows to collect directly an euclidian configuration for each subject in a unique session. It consists in collecting the sensory distance perceived between products by positioning the products on a sheet of blank paper (a tablecloth or "nappe" in French language). Judges lay out the products, simultaneously presented, on the tablecloth in such a way that two wines are very near if they are perceived as identical and that two wines are distant from one another if they are perceived as different. Each judge chooses his/her own criteria and the relative importance that he wants to give: relative importance of the criteria is thus directly taken into account. Data has to be treated by a multi-block analysis such as generalized procustes analysis (GPA) (Gower, 1975), common components and specific weights analysis (CCSWA) (Qannari, Wakeling, Courcoux, &

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Mac Fie, 2000), STATIS (Lavit, Escoufier, Sabatier, & Traissac, 1994) or multiple factor analysis (MFA) (Escofier & Pagès, 1998; Pagès & Husson, 2001). Comparisons of the methods have been done (Meyners, Kunert, & Qannari, 2000; Pagès, 1996; Pagès, 2005b) and the choice was made to treat the Napping data using MFA (Pagès, 2003, 2005a): it permits to take into account the individual judgment of each assessor (criteria and relative importance given by each panellist). Hence, this new way of data collecting provides a graphical display in which two products are near if they were globally perceived as similar by the panel of assessors, respecting the own individual evaluation. There is no good or bad response and each judgment is equally taken into account. These properties, in addition to its spontaneous and flexible aspects, make the method well fitted to the wine profession.

However, Napping® has the same main disadvantages as the sorting task previously highlighted by Tang and Heymann (2002): it would be limited to sets of 10–20 samples to limit the issues of fatigue or adaptation, reported by Schifferstein (1996). In addition, it does not characterise the product itself and it has to be completed with either instrumental or sensory data (Pagès, 2003, 2005a).

The choice was made here to first study a conventional profiling, adapted from quantitative descriptive analysis (QDA) (Stone, Sidel, Oliviers, Woosley, & Singleton, 1974), because of its accuracy (Lawless & Heymann, 1998). However, free profiling tasks such as free choice profile (Williams & Langron, 1984) or flash profile (Dairou & Sieffermann, 2002; Delarue & Sieffermann, 2004) are also attractive because they do not demand a training stage and individual tasting sessions are possible. These kinds of profiles are generally performed by subjects who have previously participated in several descriptive evaluation tasks but that were not necessarily trained together on a specific product set (Beal & Mottram, 1993; Delarue & Sieffermann, 2004; Heymann, 1994; Tang & Heymann, 2002) which is exactly the case of wine professionals.

Hence, this work proposes to first compare three sensory descriptive methods in order to evaluate their descriptive potential: a conventional profiling, taken as a reference, and two simplified profiles *a priori* adapted to wine professionals (Ultra-flash profile and free profile). In a second step, one of these three methods will be chosen and projected over the data of the wine Napping (positioning) to complete it.

2. Material and methods

2.1. Products

A group of professionals, representing local wine organisations, selected ten commercial wines. These wines were representative of the diversity found in the white wines from Middle Loire Valley and from the Chenin grape variety, both in terms of sensory properties and of reputation. Main technical characteristics of the wines are presented in Table 1.

Table 1
Characteristics of the wines

Wine	Origin	Sugar content (in g L^{-1})	Aging in oak barrels	Vintage
VDP	Loire	18.7	No	2004
ANJ_A	Anjou	20.7	No	2004
ANJ_B	Anjou	0.71	No	2004
ANJ_C	Anjou	2.5	No	2004
SAU_A	Saumur	3.5	No	2004
SAU_B	Saumur	3.5	No	2004
SAU_C	Saumur	1.31	Partially; <5 months	2004
SAU_D	Saumur	1.9	Totally; >6 months	2004
SAV_A	Savennières	2.3	No	2002
SAV_B	Savennières	3.43	Totally; >6 months	2002

2.2. Sample preparation

Bottles were stored at 11 °C. Samples (about 50 mL) were presented in clear INAO wine glasses (NF V09-110, AFNOR, 1971) labelled with random three-digit codes, covered with Plastic Petri dishes, 15 min after being taken out of the 11 °C cold room. Wines were verified free of cork taint by the panel leader. Evaluations were performed in May and June 2005 under standard conditions, in isolated booths, under white light and at room temperature (about 20 °C).

2.3. Sensory methods

2.3.1. Conventional profiling (CP)

Conventional profiling was carried out by 17 trained assessors. These judges were specifically trained for wine for 3–6 years (depending on their integration date in the panel). Sessions involved basic training to memorize and recognize the typical attributes of wine (taste, sensations, aromas and odours), booth sessions and evaluation of judge performance. For this study, 4 h of specific discussion completed the initial training in order to establish the attributes list. Attributes were generated among the set of products studied (i.e. the ten wines). The attributes list was reduced by consensus (Lawless & Heymann, 1998). When the final list was established (Table 2), two scoring booth sessions of 1 h took place as the final step of training. For the measurement step, the ten wines were presented once in a sequential monadic way and according to orders based on a William Latin-square arrangement, at a single session. Each assessor scored the wines for each term. A time delay of 120 s between samples was applied thanks to the software. Assessors scored the wines on unstructured linear scales (Jourjon, Symoneaux, Thibault, & Réveillère, 2005), anchored on the left end with "low" intensity and on the right end with "high" intensity. They marked each value on the scale. Scores were collected by FIZZ (version 2.10; Biosystems, Courtenon, France), converted to scores from 0 to 10 and exported to an Excel

Table 2
List of attributes scored in the conventional profiling

Attributes	Definitions
Colour intensity	Intensity of colour, from pale to dark
Odour intensity	Global intensity of odours
Citrus fruit odour	Intensity of orange, lemon, grape fruit odours
White fruit odour	Intensity of pear, apple odours
Tropical fruit odour	Intensity of pineapple, litchi odours
Banana odour	Intensity of banana odour
Floral odour	Intensity of hawthorn, acacia odours
Honey odour	Intensity of honey odour
Yeast odour	Intensity of yeast odour
Lactic odour	Intensity of butter odour
Vegetal odour	Intensity of vegetal, grassy odours
Spicy odour	Intensity of pepper, cinnamon odours
Mineral odour	Intensity of flinty odour
Oaky odour	Intensity of vanilla, oak odours
Reduction odour	Intensity of rotten egg, onion odours
Animal odour	Intensity of leather, musc odours
Burned odour	Intensity of toast, burn odours
Sulphur odour	Intensity of sulphur
Chemical odour	Intensity of paste, glue odours
Aggressive attack	Intensity of the burning, prickling sensation at the first sip
Aromatic intensity	Global intensity of aromas
Citrus fruit aroma	Intensity of orange, lemon, grape fruit aromas
White fruit aroma	Intensity of pear, apple aromas
Tropical fruit aroma	Intensity of pineapple, litchi aromas
Dried fruit aroma	Intensity of hazelnut aroma
Floral aroma	Intensity of hawthorn, acacia aromas
Honey aroma	Intensity of honey aroma
Yeast aroma	Intensity of yeast aroma
Lactic aroma	Intensity of butter aroma
Vegetal aroma	Intensity of vegetal, grassy aromas
Spicy aroma	Intensity of pepper, cinnamon aromas
Mineral aroma	Intensity of flinty aroma
Oaky aroma	Intensity of vanilla, oak aromas
Chemical aroma	Intensity of paste, glue aromas
Sparkling	Intensity of the sensation resulting from the presence of gas
Sweet	Intensity of sweet taste
Acidity	Intensity of acid taste
Bitterness	Intensity of bitter
Astringency	Intensity of astringent sensation
Full-body	Intensity of the sensation resulting from the presence of glycerol
Alcohol	Intensity of the sensation resulting from the presence of ethanol

spreadsheet. The final data table was constituted by 37 columns corresponding to the 37 descriptors (mean over the 17 judges) and by 10 rows corresponding to the 10 wines.

2.3.2. Napping positioning

Napping positioning was carried out by 12 professionals from Loire Valley (winemakers, wine advisors, oenologists) different from those who had selected the wines. Unlike the panels classically used in sensory analysis, this panel was not formally trained. However, it was highly experienced: professionals have a great knowledge of wine and are used to tasting them. The ten wines were simultaneously presented to each judge who was requested to lay out the products on a paper tablecloth (40 cm × 60 cm) in such a way that two wines were very near if they seemed identical and that two wines were distant from one another if they seemed different. For each wine, both X co-ordinate and Y co-ordinate were collected and compiled in a table (24 columns × 10 rows).

2.3.3. Ultra-flash profiling (UFP)

After Napping®, the 12 professionals carried out an ultra-flash profiling. Professionals were asked to enrich their Napping tablecloth by adding terms directly on the sheet to describe the wines. In practice, they wrote some words near the position of all, or most of products. For each judge and for each wine the experimenter assigned a "1" if a descriptor was cited for the wine and a "0" if not. The data table obtained was constituted by 12 sub-tables corresponding to the 12 judges and by 10 rows corresponding to the 10 wines.

2.3.4. Free profiling (FP)

Professionals were finally asked to collect the terms associated to the wines on their Napping tablecloth. They were then encouraged to delete the synonyms and the antonyms (the choice was the matter for the own decision of judges), and to define the scale bounds. Hence, they constituted their own list of descriptors (in practice, some judges added new words). Wines were presented in a sequential monadic way and according to orders based on a William Latin-square arrangement. Professionals then scored each product for each attribute of his/her own list on unstructured linear scales, anchored according to their own bounds. Scores were collected by FIZZ, converted to scores from 0 to 10 and exported to an Excel spreadsheet. The data table obtained was constituted by 12 sub-tables corresponding to the 12 judges and by 10 rows corresponding to the 10 wines.

2.4. Data analyses

Data analyses were performed using Stagraphics Plus software (version 5.1; Statistical Graphics Corp., Sigma Plus, Toulouse, France), FactoMineR package (Husson, Lê, & Mazet, 2006) and SPAD software (SpadVersion: MN: 6.0.1, Paris, France).

2.4.1. Comparison of the three sensory descriptive methods

2.4.1.1. Selection of attributes from the conventional profiling. Analyses of variance according to the model attribute = judge + product + ε was used to select the discriminating attributes. Thirty seven attributes (p-values <0.10) over forty one rated by the panel were kept.

2.4.1.2. Comparison of the three descriptive methods. Data were treated following the common sensory procedure: data from free methods were treated as individual data and data from conventional profiling were treated by considering the means over the panel. In addition, considering the training involved in conventional profiling methods, it can be assumed that the panellists share the same sensory meaning for a given descriptor. Thus, it is possible to work with the data means. This is why data from conventional profiling methods are so robust.

In this study, data were thus organised in a table of 10 rows, corresponding to the 10 wines, and described by three groups of variables (Fig. 1). The first group corresponded to the data from ultra-flash profile (156 terms) and the second group to the data from free profile (195 individual attributes). Each individual attribute constituted a column. The third group corresponded to the data from the Conventional Profile (37 attributes). Each column corresponded to the mean of the 17 trained assessors.

This table was treated by hierarchical multiple factor analysis (HMFA) (Le Dien, 2003; Le Dien & Pagès, 2003) in which every variable was normalised. This method is an extension of multiple factor analysis (Escofier & Pagès, 1998; Pagès & Husson, 2001) and it allows to compare the groups (in the present case, the methods) in the same subspace. It takes into account of the hierarchical structure of the data (Fig. 1) and balances the role of the data at each level. In the present case, HMFA first split the variables into two groups in order to compare the conventional profiling (carried out by trained panellists) with free methods (carried out by wines professionals). The second level then split the two free methods into two groups (UFP and FP). Finally, the third level split each free method into 12 groups corresponding to the 12 wine professional. Thanks to this last level of balance, each professional played the same role within his/her group whatever the number of descriptors he/she used.

Fig. 1. Data structure.

This analysis offered convenient tools, such as superimposed representation or groups representation (Le Dien & Pagès, 2003). They allowed to compare on the one hand wines representations emerging from conventional profiling and from free methods and, on the other hand the representations emerging from the two kinds of free methods to one another.

2.4.2. Wine characterisation using Napping positioning completed with UFP

Data was constituted by the co-ordinates (*X* and *Y*) of the wines on the tablecloths of each judge (Fig. 2). A Multiple factor analysis was performed on the data. Each judge constituted a group of two un-standardised variables (*X* and *Y*) in order to respect the disparities between horizontal and vertical variances. Descriptors (from UFP) were added as supplementary variables. They did not participate in the construction of the axes but each correlation coefficient with the factor of MFA was calculated and represented. Hence, wine representation was obtained just from Napping co-ordinates whereas wines were described thanks to the UFP descriptors.

3. Results and discussion

3.1. UFP coding

Some tasters added quantitative adjectives before the attributes. However, choice was made not to take into account these adjectives since it would be difficult to convert them into scores: the interval-level requirement between two levels (for instance between "slightly", "few" and "many") is unclear and could not represent equal sensory differences (Lawless & Heymann, 1998). This position should lead to a loss of information, but we assumed that it could be offset by the scoring step (FP) of these attributes. In addition, we considered that even if an odour or an

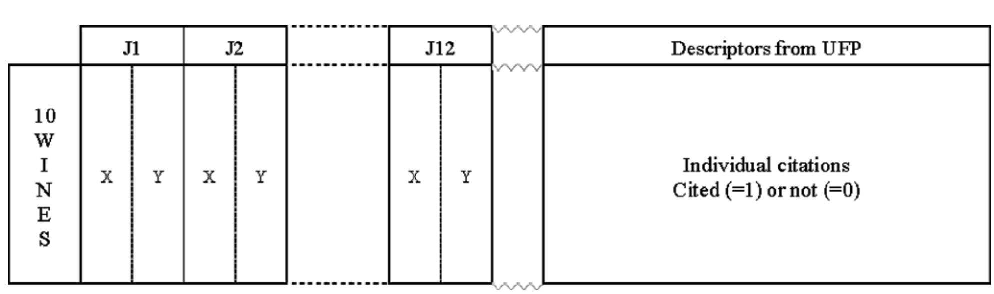

Fig. 2. Napping data structure. Data is arranged in 13 blocks: 12 active groups corresponding to the Napping co-ordinates (values of *X* and *Y* in cm) and one illustrative group corresponding to the descriptors from UFP.

aroma was “slightly” present, it was even so present. A “1” was thus logically assigned.

3.2. Comparison of the three sensory descriptive methods

3.2.1. Inertia

Table 3 shows the results of the separate analysis of each group, at the second level. The eigenvalues on the first axes were very different, particularly between conventional profiling and the simplified profiles. Thanks to the specific balance of the HMFA, the projected inertia of each group was equivalent for the first factor, at each level, as shown by co-ordinates of groups (Table 4). HMFA balances were effective both between CP and simplified profiles (for which cumulative co-ordinates on the first axis corresponded to the first eigenvalue) and within simplified profiles (UFP and FP). The first factor accounted for 31.55% of the total inertia. The first four axes accounted for about 70% of the total inertia and will be kept for the analysis. The third and fourth axes reflected mainly the effects of ultra-flash profiling and of free profiling (co-ordinates on F3 and F4) whereas conventional profiling was mainly expressed on the two first axes, which was confirmed by the eigenvalues of the separate analyses.

3.2.2. Wines characterisation

Table 5 presents the contribution of the wines which participated the most to the construction of the four axes studied. The first axis of the HMFA (Fig. 3a) opposed the wines SAV_B and SAU_D (for which cumulative contributions were about 77%) to the others. The second axis opposed mainly the wine ANJ_B (which contributed alone

Table 3
Results of the separate analyses performed in the HMFA (PCA on conventional profiling data, multiple factor analyses on ultra-flash profiling and on free profiling data)

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Eigenvalues					
Conventional profiling	17.8293	7.8252	4.1331	2.7877	1.4598
Ultra-flash profiling	8.0464	6.4452	5.0223	4.1143	3.6807
Free profiling	8.2392	4.6771	3.6387	2.8586	2.5683
Percentages					
Conventional profiling	48.19%	21.15%	11.17%	7.53%	3.95%
Ultra-flash profiling	21.74%	17.41%	13.57%	11.12%	9.95%
Free profiling	28.03%	15.91%	12.38%	9.72%	8.74%
Cumulative percentages					
Conventional profiling	48.19%	69.34%	80.51%	88.04%	91.99%
Ultra-flash profiling	21.74%	39.15%	52.72%	63.84%	73.79%
Free profiling	28.03%	43.94%	56.32%	66.04%	74.78%

Table 4
Eigenvalues and co-ordinates of groups

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Eigenvalue	1.9638	1.0797	0.7624	0.5868	0.4444
Percentage	31.55	17.34	12.25	9.42	7.14
Cumulative percentage	31.55	48.89	61.14	70.56	77.70
Co-ordinates					
Conventional profiling	0.9844	0.4294	0.2360	0.1499	0.0749
Simplified profiles	0.9794	0.6502	0.5265	0.4369	0.3695
Within simplified profiles					
Ultra-flash profiling	0.9528	0.7384	0.6333	0.5253	0.4684
Free profiling	0.9746	0.5411	0.4028	0.3345	0.2586

Table 5
Contribution of some wines to the construction of axes

Axis 1		Axis 2		Axis 3		Axis 4	
SAV_B	48.32%	ANJ_B	52.70%	VDP	47.04%	SAU_B	44.30%
SAU_D	28.76%	SAU_A	22.81%	SAU_B	18.84%	ANJ_C	26.10%
ANJ_B	6.37%	ANJ_C	12.94%	ANJ_A	14.87%	ANJ_B	15.13%
ANJ_A	5.16%	SAU_C	3.64%	ANJ_B	13.21%	SAU_A	7.33%
SAU_B	3.64%	SAV_B	3.56%	SAU_A	2.68%	VDP	4.10%

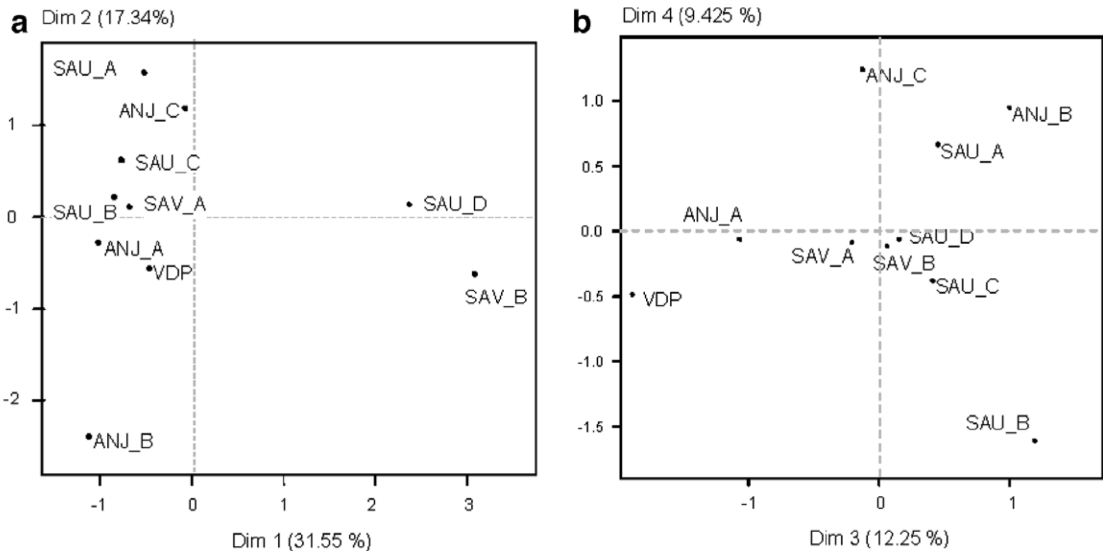

Fig. 3. Wines representation (HMFA, plane 1–2 and 3–4).

to 53% of the axis construction) to the others, particularly to ANJ_C and SAU_A. The third axis (Fig. 3b) opposed mainly VDP, and in a lesser way ANJ_A, to the other wines, particularly to ANJ_B and SAU_B. The fourth axis opposed SAU_B to ANJ_C, ANJ_B and SAU_A.

Due to the great number of variables (388), the correlation circle could not be represented with all the variables. Characterisations emerging from the three methods are illustrated by Figs. 4–6 which represent the descriptors that were most correlated to axis 1, to axis 2 and to axes 3 and 4, respectively.

3.2.2.1. An oaky dimension (Fig. 4). The trained panel perceived SAU_D and SAV_B as full-bodied wines, presenting an intensive colour and intensive oaky, lactic, spicy, honey, dried and tropical fruits notes. These wines were low in sulphur and reduction notes. Study of the statistically significant differences (analyses of variances associated to multiple comparison tests; data not shown here) confirmed this description. Characterisations provided by professionals (both from UFP and FP) were close: they also described these wines as oaky, with intensive colour and aromas of vanilla, butter and with lactic and fermented notes. They perceived these two wines as "complex", "strong", "long", etc. These terms possess a hedonic connotation. It seems difficult for the wine professional tasters to renounce their use of such terms (Brochet & Dubourdieu, 2001; Lehrer, 1975; Zamora & Guirao, 2004). It is interesting to note that the oaky character and the colour, which could be considered as obvious characteristics for wine professionals, were not mentioned spontaneously by all the tasters. Moreover, others notes, such as vanilla or spices, are known to come

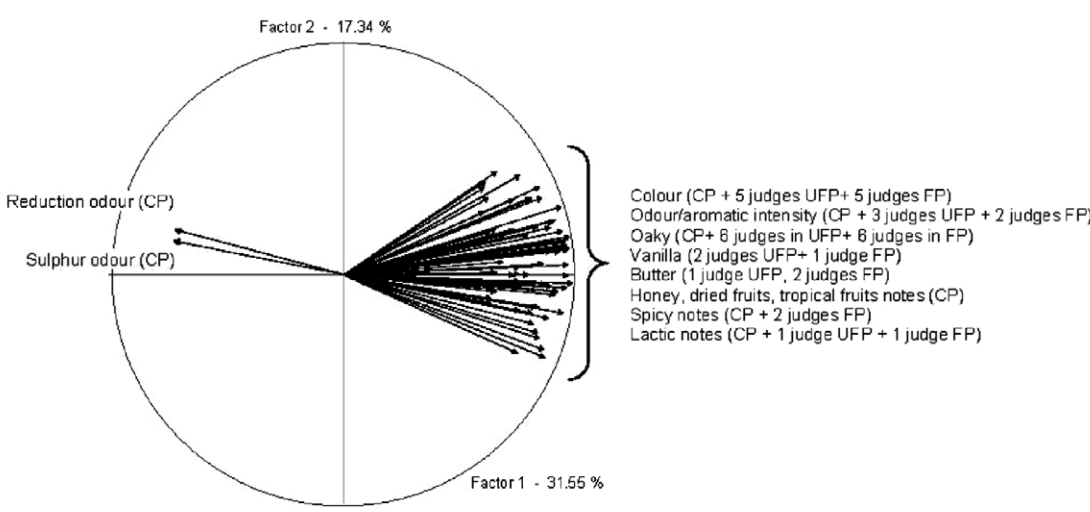

Fig. 4. Representation of the attributes that were most correlated to axis 1 (HMFA). CP: conventional profiling, UFP: ultra-flash profiling, FP: free profiling. Each arrow corresponds to one variable (collective attribute of CP or individual attribute of UFP or FP).

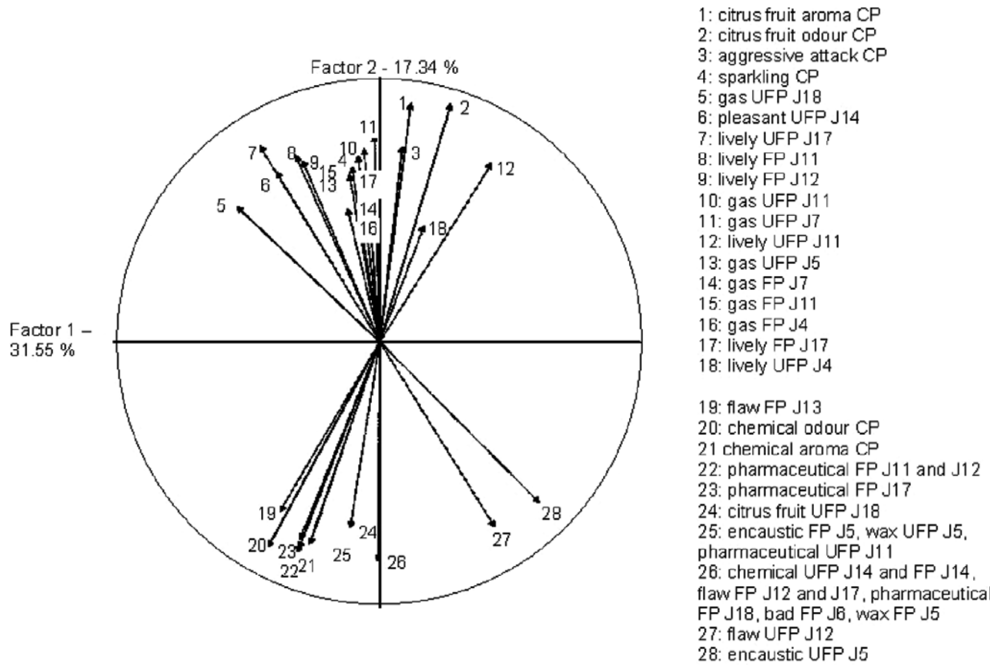

Fig. 5. Representation of the attributes the most correlated to axis 2 (HMFA). CP: conventional profiling, UFP: ultra-flash profiling, FP: free profiling. Each arrow corresponds to one variable (collective attribute of CP or individual attribute of UFP or FP, followed by the code of the judge who generated it).

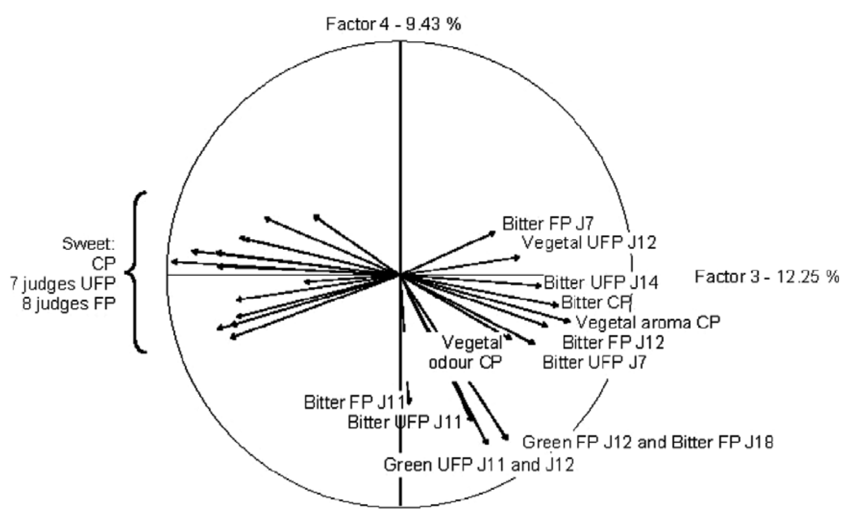

Fig. 6. Representation of the attributes the most correlated to axis 3 and axis 4 (HMFA). CP: conventional profiling, UFP: ultra-flash profiling, FP: free profiling. Each arrow corresponds to one variable (collective attribute of CP or individual attribute of UFP or FP, followed by the code of the judge who generated it).

from the oak barrels (Ribéreau-Gayon, Dubourdieu, Donèche, & Lonvaud, 1998) and were cited by tasters who did not use the word ‘‘oaky’’.

3.2.2.2. A peculiar wine (Fig. 5). Wine ANJ_B was described by the trained panel as presenting chemical notes and by the professionals as ‘‘encaustic’’, with ‘‘chemical’’ and ‘‘pharmaceutical’’ notes, and with the term ‘‘flaw’’. This is the reason why this wine was particularly highlighted.

3.2.2.3. A sparkling dimension (Fig. 5). Wines ANJ_C and SAU_A were perceived as sparkling and lively (presence of ‘‘CO_2’’ and ‘‘gas’’), with an aggressive attack and with citrus fruits notes.

3.2.2.4. A sweet dimension (Fig. 6). The third axis opposed VDP, and in a lesser way ANJ_A, to the other wines because of their sweet character. This aspect was underlined by the three methods. These wines contained about 20 g L^{-1} of residual sugars. They were mainly opposed to

ANJ_B and to SAU_B which were described as bitter and with a vegetal aroma.

3.2.2.5. A vegetal wine (Fig. 6). The third and the fourth dimensions represent respectively about 12% and 9% of the total inertia and highlight the wine SAU_B (Fig. 3b). This wine was described both by the trained panel (on the third axis) and by wine experts (third and fourth axes) as a vegetal and bitter wine. The fourth axis opposed mainly this wine to ANJ_C, described by the trained panel as a floral wine.

3.2.3. Comparison of the methods

3.2.3.1. Representation of the groups. Representation of the groups is presented in Fig. 7a and b and expresses how each group of variables are related to the principal components. The proximity of the groups and the high value of the inter inertia/total inertia ratio on the first axis (0.98) proved that the three groups were close. On the second axis, groups were a little bit different but the inter inertia/total inertia ratio was still high (0.94). This attests of similar representations by both methods. However, the groups differed on the third and on the fourth axes (Fig. 7b). Ratios were still high yet lower than for the two first axes (0.86 and 0.81): groups did not evaluate the wines exactly in the same way. With the CP, the wine discrimination on these axes was lower than with the FP and than with the UFP (as shown by co-ordinates, Table 4). For CP, variance was concentrated mainly on the first two axes whereas variance from the free methods was expressed on the first four axes. These results are in agreement with what can be observed in Fig. 6: descriptors well represented on the third and fourth axes were mainly those from UFP and FP. The gap observed between the three methods can be explained by the great number of variables for both free methods that made the synthesis of the information more difficult to obtain.

3.2.3.2. Superimposed representation. HMFA also provides a specific graph, called superimposed representation. This representation allows to interpret the proximity between the methods for each product. In this representation (Fig. 8a and b), each wine is represented through five points:

- three points corresponding to each method (CP, UFP and FP);
- the mean point of the two kinds of free profiling;
- the general mean point (of the three methods).

On the plane 1–2 (Fig. 8a), the three points corresponding to each method were close to one another: configurations emerging from the three methods were similar. This was particularly true for the wines SAV_B, SAU_D, ANJ_C and SAU_A (inertia was less than to 15% for both axis) but this was less true for the wine ANJ_B, for which inertia on the second axis was the highest observed (inertia = 45.28%). The UFP method underlined the most this peculiar wine. Fig. 8b shows that the groups also differed in the evaluation of VDP (inertia on the third axis = 45.6%) and SAU_B (inertia on the fourth axis = 41.2%). These wines were more underlined by the two free methods, particularly by the UFP.

Altogether, the two free methods were closer to each other than to the CP: the RV coefficient between UFP and FP was about 0.94 whereas it was less than to 0.90 between CP and free methods. For FP and UFP, variance was more diffuse than for CP but these methods allowed a better discrimination of wines. These results also indicate that for the free methods, citations or scoring provided similar product maps, in spite of the streamlined UFP

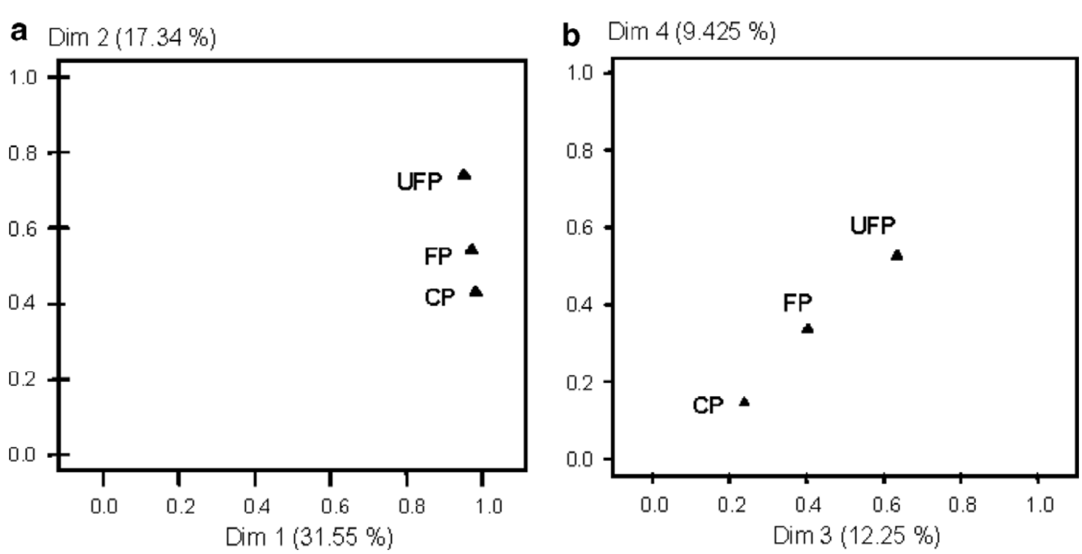

Fig. 7. Representation of the groups of variables (HMFA, plane 1–2 and 3–4). CP refers to the group which comprises all the attributes from conventional profiling, UFP, from ultra-flash profiling and FP, from free profiling.

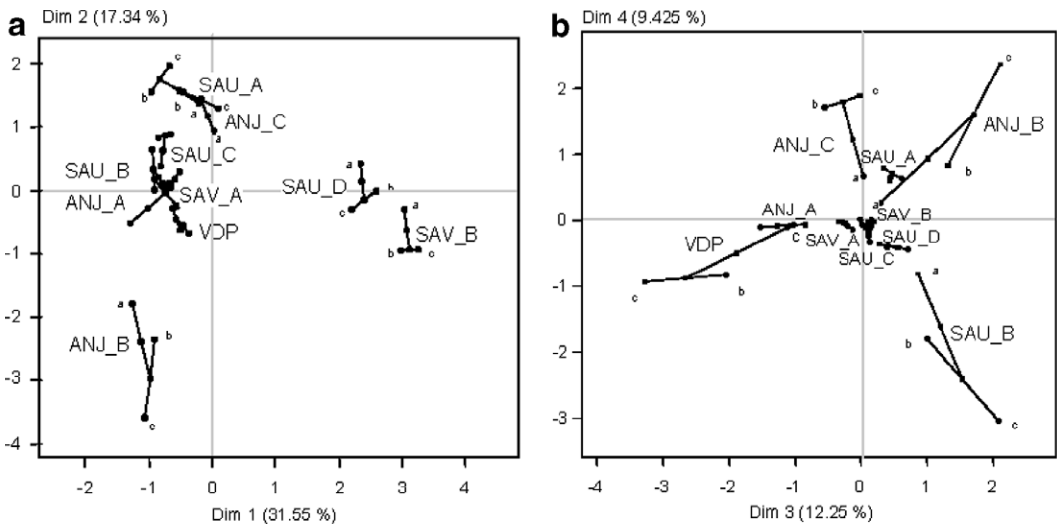

Fig. 8. Superimposed representation of wines (HMFA, plane 1–2 and 3–4) – a: CP; b: FP, c: UFP. Each wine is represented through the three points corresponding to each method (CP, UFP and FP), the mean point of the two kinds of free profiling and the general mean point (of the three methods).

coding. Le Dien, Husson, and Pagès (2001) compared citations and scores (yet citations were deduced from the scores) and they also found that the use of scores or citations had little consequences on the interpretation.

3.2.4. Choice of one of the three method to complete Napping®

In this example, the main characteristics were underlined by all three methods. The free methods seemed to provide a greater discrimination of the products, particularly on the third and fourth axes. However, this larger number of dimensions is probably due to the methodology used and may be the result of the larger number of attributes in the free methods. By considering the data of the free methods as individual, dimensions shared by only some tasters were highlighted. On the contrary, with the CP method and the selection of the discriminating attributes, only the consensual dimensions were highlighted. By considering the CP data as individual, a greater discrimination might also be observed. Considering practical aspects, conventional profiling was the easiest to interpret (due to its low number of descriptors) but also the most time-consuming for judges. On the contrary, FP was less time-consuming but difficult to interpret because of how differently the professionals used the scales. The data collection from UFP was partly arbitrary (for example, does “quite acid” corresponds to level “0” or level “1”?) and there is no statistical means to

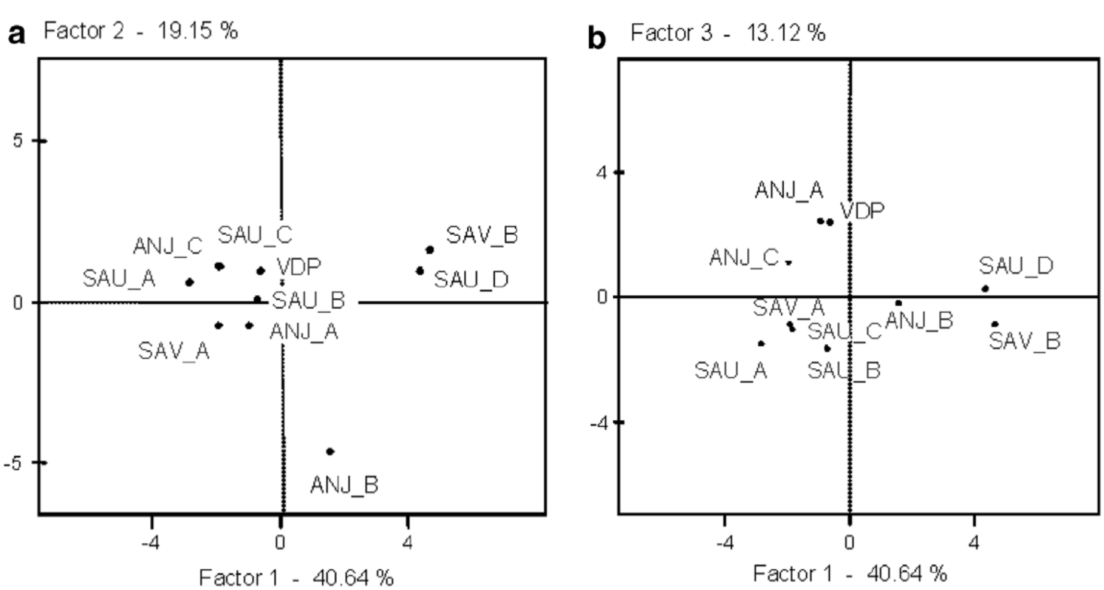

Fig. 9. Wines representation emerging from Napping (MFA, plane 1–2 and 1–3).

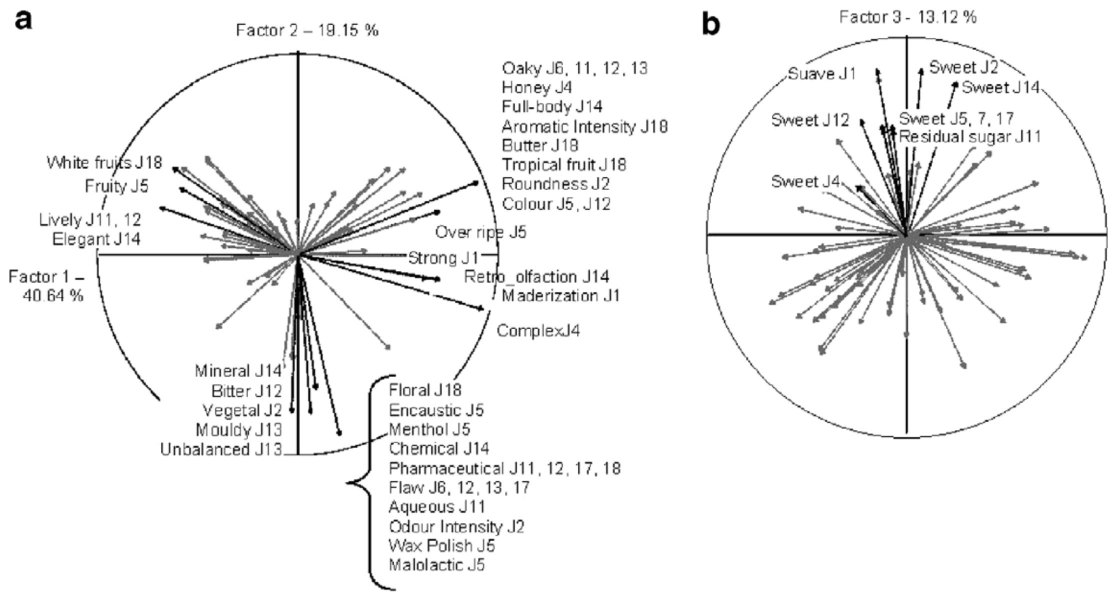

Fig. 10. Wines characterisation emerging from Napping combined with UFP (MFA, plane 1–2 and 1–3). Each arrow corresponds to an individual descriptor of UFP, followed by the code of the judge who used it.

assess the validity of the results, but this method was the least time-consuming. Moreover, it was performed simultaneously to Napping® and it easily provided wine characterisation. UFP appeared here to be a good complement to Napping® and to be well adapted to wine professionals.

3.3. Napping positioning completed with UFP

MFA performed on the Napping data is illustrated Fig. 9. It highlighted the wines SAV_B and SAU_D on the first axis, which accounted for 40.6% of the total variance, the wine ANJ_B on the second axis (19% of the total variance) and the wines VDP and ANJ_A on the third axis (13% of the total variance). These wines were perceived as previously described (Fig. 10): SAV_B and SAU_D were described as intense, oaky and with various aromatic notes (honey, tropical fruit, butter, over-ripe); wine ANJ_B as chemical/pharmaceutical; wines VDP and ANJ_A as sweet wines. Nevertheless, the Napping® method did not highlight ANJ_C and SAU_A: the sparkling dimension highlighted with the descriptive methods did not constitute an important discrimination criterion for wine professionals.

4. Conclusion

Even if the results provided by the three descriptive methods (conventional profiling, ultra-flash profiling and free profiling) are not identical, they gave similar representations. The main characteristics were underlined by all three methods or, taking another point of view, by the two kinds of panellists (trained panellists or wine professionals). For professionals, wines were described in the same way whatever the way of assessing (citation or scoring). Considering both practical aspects and richness of the characterisation, UFP appeared here to be a good complement to Napping® and to be well adapted to wine professionals. The second step of this study combining Napping® with UFP appeared to be less subtle than a descriptive method (only five wines were highlighted) but it revealed only the criteria which were important for wine discrimination according to the wine professionals. Moreover, this combination showed that it was possible to benefit from the great knowledge of wine professionals with consistency. Napping® combined with UFP could not replace quantitative data obtained from a trained panel but it could be used when accurate description is not necessary and when the access to a trained panel is limited. For instance, in the wine industry, it could be used for pre-sorting of wines before blending. Finally, it could be presupposed that a better harmonisation in the use of the terminology by the professionals would give better results. In future experiments, UFP could be modified by proposing a list of attributes to associate to the wines. However, such adjustments would be contrary to the spirit of the spontaneous and free methods. The compromise solution would consist in proposing a list of attributes as a common starting point for the individual lists. This list would be completed by the attributes considered as important for each taster. The relationship between the CP attributes and the terms used by the wine professionals in the free methods could serve to establish the common list of terms.

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