Chapter 4:9

Method development for brandy ageing based on oak chips use

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Introduction

After the distillation, spirits can be maturated from several months to many years in wooden barrels. Dissolution of wood components is thought to be of prime importance. Wood is known to add value to the quality of spirits during ageing. Oak wood has been used for well over two thousand years to support the ageing of alcoholic beverages. The qualities of oak wood which favour its use for the aging of spirits include its mechanical and working properties (durability, hardness, pliability, permeability) and the extractable compounds that it contains (tannins and aromatic components). Among the many factors known to influence final quality, the most important contributor is undoubtedly the oak barrel in which maturation takes place. During the time that the raw distillate spends in the barrel, major changes occur in the chemical composition of the spirit, resulting in a product which has matured and become more acceptable to the palate. This process, called ageing or maturation, considerably modifies the composition of the beverage, allowing the production of world's most famous spirits.

Several factors, such as the kind of wood, the heat treatment of the barrels and the ageing time have a critical influence on sensory and physicochemical composition of these brandies (Van Jaarsveld et al, 2009).

Despite the positive impact on brandy quality, ageing in wooden barrels does have a downside. Costs increase in proportion to the length of the ageing period because capital is tied up. Wooden barrels are expensive and difficult to clean and to maintain. Evaporation from wooden barrels is higher than from stainless steel tanks.

Due to this fact, it would be interesting to explore alternative ageing systems (Singleton and Draper, 1961). Treatment with oak chips, especially charred or toasted chips, is considered to hasten brandy ageing (Schwarz et al, 2014). The simplest method of adding wood-derived compounds is the use of oak chips, which are increasingly used for the maturation of many brandies (Mosedale and Puech, 1998). Subject to some limitations, using oak chips is regulated. Among the few additives that are authorised for the production of appellation d'origine contrôlée (AOC) eaux-de-vie are wood extracts. Oak extracts obtained by the traditional method of preparation, by extracting oak chips with boiling water use only, are usually devoid of most volatile components, consisting primarily of oak tannins or their degradation products (Mosedale and Puech, 1998).

Currently, in Switzerland, many cider farms are interested in the performance of trials to diversify the product with apple brandy production. However, this need is being slowed down by the fact that at least few years of aging and a large volume of fruit spirit are necessary. Due to this fact, it is very interesting to have an alternative ageing system which allows minimising the aging time and the necessary volume of wine spirit and still producing a similar product to the one obtained by the traditional ageing system. The obtained products were compared by sensory evaluation. The objective of this study was to obtain an alternative aging method by using different oak chips which allowed us to obtain, in a short period of time and with a small volume of wine spirit, a product of a similar quality to the one obtained by the traditional aging system. For that purpose, we carried out a laboratory experiment applying different conditions with regards to the amount of wood shaving and the extraction method. The

products were then compared by sensory evaluation, with a reference apple brandy that was aged in the traditional way (two years in oak barrels)

Materials and Methods

Preparation of oak extracts. French oak chips were obtained from a commercial supplier (Boisé France). Toasting levels varied depending on the supplier. Untoasted (BF), medium (SCA and DCA) and heavy (DC 180, DC 190 and DC 210) toasted French oak chips were tested. Chips were added at 2 g/L at 40% and 60% (v/v) (diluted from 80 %) of a non-matured apple spirit. Extraction was allowed for2 months at 15°C.

Sensory Evaluation. A panel of 15 judges was used. The 60% v/v distillates were diluted with distilled water to an alcohol content of 40% and 20% v/v. Samples of 10 mL were presented at random at 15 °C in coded, black glasses (INAO type). Samples were evaluated at a room temperature of 22°C under white light. The different modalities were presented simultaneously to each judge who was asked to give an olfactory profile. The sensory perception of each modality was evaluated by the PCA method. Data were collected using a computer system (FIZZ Network version2.0, Biosystems, Couternon, France).

In the two-out-of-five test, the panellist was given five samples. The panellist was instructed to identify the two samples that are different from the three others. The samples were coded with three-digit numbers and sampled in the order of their presentation to the judges according to a Latin square Williams to avoid presentation order bias. The panellists were asked to divide the samples in two groups according to their similarities.

Statistical Analysis. Statistical analyses in the present study were performed using STATISTICA 10.0 (Statsoft, 2011) and FIZZ 2.0 software (Biosystems, Couternon, France).

Results and Discussion

To obtain a final accelerated aging model, several trials were carried out according to the following variables: type of oak, extraction method, chip amount, etc. With the aim of selecting the best accelerated aging conditions after several trial, the obtained samples were used to generate the descriptors, preceding the descriptive profiling test. The multivariate analysis by means of the Principal Components of the sensory data extracted components which explained 93.4% and 75.5% of the variance obtained by the olfactory and gustatory tests, respectively. In fact, each oak chip treatment was characterised. For each experiment, three clusters were identified (Figures 1 and 2).

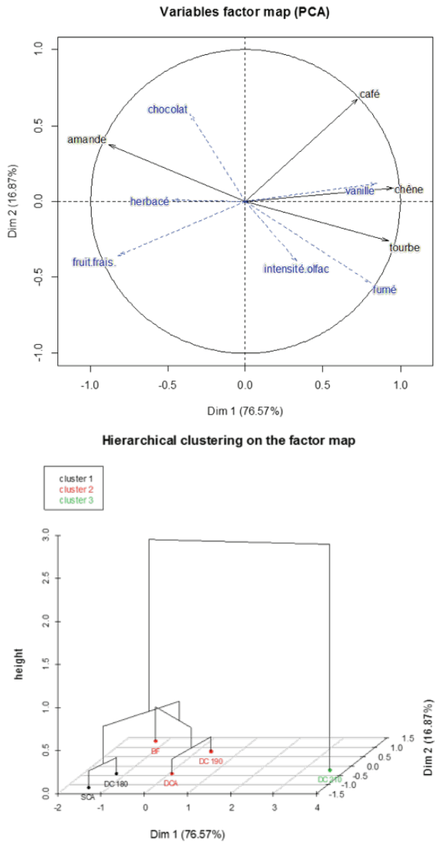
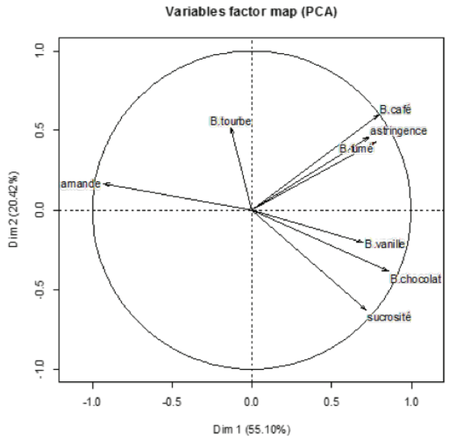


Figure 1. olfactory profile obtained with 60% (v/v) extracts reduced to 40% (v/v) for sensorial analysis.

According to these results, the most similar sample to the reference of an apple Brandy that was aged in the traditional way was selected. The results in table 1 showed that the panellists were able to differentiate the brandies at a very high significance level.



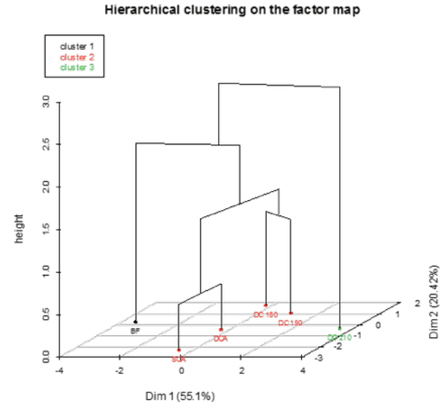


Figure 2. gustatory profile obtained with 60% (v/v) extracts, reduced to 20% (v/v) for sensorial analysis.

	No answer	Answer expected	Answer correct	signif.
Oak chips/ traditional	0	15	12	<0.0001*

Table 1. Results of test 2 out of 5 (*Significant with the level of 99.9%. Treatment uses the binomial rule (or distribution) with 1/10)

Conclusion

It can be concluded that some of the samples obtained through accelerated aging by using wood chips for two months showed sensorial characteristics and an acceptance that are very promising. However, results obtained by the discriminative test suggest that it is too early to propose the alternative accelerated aging method as a validated tool to produce brandies with similar characteristics to those aged through a traditional process. Several improvements will be considered for further studies, notably the possibility of blending different extracts, based on chemical analysis of polyphenols and aromas.

References

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