Taking Port Wine aroma all over the world: Construction of a Tawny Port Wine-like fragrance

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Introduction and aims

A unique wine landscape was created almost two millennia ago on the slopes of the Douro River valley and its tributaries, creating a wine marked by a deep articulation between tradition and modernity. Port Wine is the ultimate expression of the RDD's history, cultural heritage of work, experience and art. Tawny Port Wine is aged in barrels and is characterized by aromas of dried fruits, honey, wood and toasted vanilla. Consumers everywhere are becoming more knowledgeable and curious and therefore more likely to be attracted to wines such as Port which represent genuine quality and tradition and which have fascinating stories to tell. To raise and keep alive one of the richest products of the Douro region, the aim of the present work was to develop a Port Wine Tawny fragrance, the first according to the literature.

Practical work

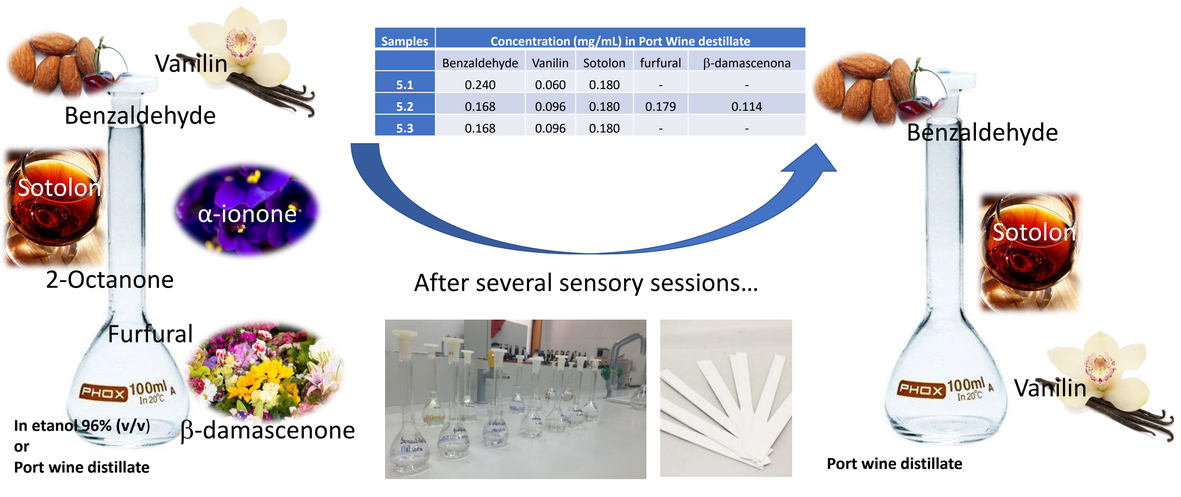
1. Panel training and Tawny Port Wines descriptors selection

Tasters	Vocabulary generation	Descriptors grouping	Screening by frequency of use	Compound search
• 9 Women • 3 Men • 45-60 Years	• Aromas identification of four Tawny Port Wine samples	• Descriptors grouped into aromatic families	• Descriptors with a frequency greater than 50%	• Science direct and national centre for biotechnology

2. Fragrance Development

Six aromatic descriptors were selected; the most significant of Tawny Port Wines: alcohol, nuts, spices, wood, sweet/honey and floral/dried flowers. To these descriptors were assigned 7 aromatic compounds.

Nineteen fragrances, with different concentrations of these compounds, were developed with the contribution of the panel. At the end of this stage, there were selected 3 fragrances (5.1, 5.2 and 5.3), two of them developed with only 3 aromatic compounds: benzaldehyde, sotolon and vanillin.



Samples	Concentration (mg/mL) in Port Wine destillate				
	Benzaldehyde	Vanilin	Sotolon	furfural	β-damascenona
5.1	0.240	0.060	0.180	-	-
5.2	0.168	0.096	0.180	0.179	0.114
5.3	0.168	0.096	0.180	-	-

After several sensory sessions…

3. Consumer´s study

The panel consisted of 150 individuals. After smelling each sample, consumers were asked about the acceptability of the 3 fragrances, through a hedonic scale of 9 points where 1 corresponds to "I detest", 5 to "I do not like nor disgust" and 9 to "I love". Then, after choosing a preferred fragrance, the intention to buy and use was evaluated, namely at home, with yes/no answer questions. The suitability of some characteristics (Port Wine-like odor and color of the fragrance) was evaluated in a scale of five intensity points - JAR [1], with classification 3 being the ideal intensity. Score 1 - very low intensity; Score 2 - low intensity; score 4 – intense; and 5 - too intense.

Main results

The panel consisted of 150 individuals (73 women and 77 men), mostly of Portuguese nationality. The women had ages between 17 and 63 (M=37.74; SD=14.51) and the men between 16 and 83 (M=43.56; SD=16.46). Professionally, 41 (27.3%) individuals were associated with the area of Enology.

A positive classification was obtained from the 3 fragrances. Male subjects assigned higher punctuation and had a preference for fragrance 5.1 with statistically significant (MANCOVA) (λ_{wilks}=0.87, $F_{(3,\ 145)}$=7.06, p<0.001) – Table 1.

After sorting the 3 samples, consumers were asked to indicate which fragrance was preferred. To verify the existence of an association between gender and the preferred fragrance, the chi-square (χ^2) test was performed. The results observed in Table 2 indicate that there is no significant association between male and female individuals and the choice of fragrance, ($\chi^2_{(2)}$=2.60, p=0.27). However, fragrance 5.1, which obtained the highest classifications by the males, distributes the preference with the fragrance 5.3.

Table 1 - Classification of the 3 fragrances according to gender.

	Fragrances	M±SD	N
Women	5.1	6.04±1.54	73
	5.2	6.42±1.23	73
	5.3	6.55±1.39	73
Men	5.1	7.06±0,90	77
	5.2	6.68±1.14	77
	5.3	6.74±1.34	77

Table 2 - Preferred fragrance based on gender of subjects and respective percentage.

	Fragr. 5.1	Frag. 5.2	Fragr. 5.3
	N	N	N
Female	17 (23.3%)	24 (32.9%)	32 (43.8%)
Male	27 (35.1%)	20 (26.0%)	30 (39.0%)
Total	44	44	62

To verify the existence of an association between the preferred fragrance and the intention to buy, the χ^2 test was performed. The observed results indicate that there is no statistically significant association ($\chi^2_{(2)}$=2.88, p=0.24) (Table 3). The percentage of consumers who would buy the favorite fragrance is over 65% for all 3 fragrances, confirming that there could be a good acceptance, if we were facing a commercial product.

To evaluate whether the preferred fragrance was included in the scale considered ideal for the consumer, a JAR scale was used. Two characteristics, odor intensity, and color intensity were tested. Based on the statistical analysis (MANCOVA) we concluded that the differences are not of significant (λ_{wilks}=0.98, $F_{(2,\ 290)}$=0.93, p=0.45) -Table 4.

Table 3 - Intention to purchase the preferred fragrance based on the number of individuals and their percentage.

Intention to buy	Fragr. 5.1	Fragr. 5.2	Fragr. 5.3
	N	N	N
Yes	36 (81.8%)	29 (65.9%)	45 (72.6%)
No	8 (18.8%)	15 (34.1%)	17 (27.4%)
Total	44	44	62

Table 4 - Characterization of the preferred fragrances with respect to the intensity of the odor and color.

	Fragrance	M±SD	N
Odor intensity	5.1	3.16±0.65	44
	5.2	3.30±0.88	44
	5.3	3.11±0.45	62
Color intensity	5.1	2.36±0.84	44
	5.2	2.25±0.89	44
	5.3	2.39±0.91	62

Conclusions

The use of the 3 compounds (benzaldehyde, sotolon and vanillin) appears to be enough to obtain a fragrance of Tawny Port Wine. Consumers considered that the intensity of Port Wine aroma its ideal in the 3 fragrances. However, the color is considered not very intense. There are aromas associated with specific colors [2] and there are authors who argue that, in order to facilitate the communication of fragrances, the colors that people tend to associate with certain aromas are used [3]. But, the presence of color in the fragrance can also be misleading for the detection of an aroma. For this reason it was decided to present the Tawny Port Wine fragrances to the consumers, devoid of any color. However, just as when we see a yellow candle, we expect a lemon scent, perhaps consumers also expected a characteristic Tawny Port wine color for the fragrances.

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