

Sensory evaluation of Fetească Neagră wine in Republic Moldova

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Abstract. Wine industry of Moldova is a strategic priority branch of national economy. Local variety Fetească Neagră (FN) represents the authenticity of terroir and region of Moldovan wines. Present study is based on sensory evaluation of 12 wine samples from three geographically protected regions and vintages of 2016 & 2017. The purpose of this experiment is to discover the sensory characteristics of FN wines to provide the reference for production of Protected Geographical Indication (PGI) wines with regional characteristics. Through the analysis of evaluation results it was found that sensory characteristics of FN wines showed great differences in years, and no obvious differences were found in regions. This result does not suggest that differences in three regions do not exist. We concluded the necessity of further research to get a clearer picture of identity of FN wines.

Key words: region; local grapes; tasting sheet; organoleptic profile; vintage; terroir; Protected Geographical Indication (PGI).

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Сенсорная оценка вина Фетяска нягрэ в Республике Молдова

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Аннотация. В Республике Молдова винодельческая промышленность является стратегически приоритетной отраслью национальной экономики. Местный сорт винограда Фетяска нягрэ представляет собой аутентичность терруара и региона молдавских вин. Настоящее исследование основано на органолептической оценке 12 образцов вин из трех географически охраняемых регионов и урожаев 2016 и 2017 гг. Цель исследования заключалась в определении органолептических характеристик вин Фетяска нягрэ для создания эталона марки вина, защищенном географическим указанием (ЗГУ) с региональными характеристиками. При анализе результатов оценки было установлено, что органолептические характеристики вин из сорта Фетяска нягрэ сильно различаются по годам, а явных различий по регионам обнаружено не было. Сделан вывод о необходимости дальнейших исследований, чтобы получить более четкое представление об идентичности вин Фетяска нягрэ.

Ключевые слова: регион; местный виноград; дегустационный лист; органолептический профиль; год урожая; терруар; защищенное географическое указание (ЗГУ).

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Introduction

Fetească Neagră (FN) is a local variety, originated from the area (region) along the Prut river [1], cultivated in the Moldova area with a history over 2000 years. Moreover FN is one of the most cultivated varieties in the Republic of Moldova. Until 2019, the planting area registered in RVV (National Vine and Wine Registration System) is 242.0 ha, including 54.0 ha taken in evidence for the production of wines with Protected Geographical Indication (PGI). This variety has the potential to produce high quality wines, usually red wines [2]. As a local variety, Fetească neagră is suitable for Moldovan

climate condition, it can represent the terroir of Moldovan wine and the authenticity of producing area. Currently, it is cultivated in three geographical protection production areas of Moldova and can be used to produce PGI and regular wines.

With the development of economy and the improvement of international consumption of wine, more and more countries and products began to introduce geographical protection systems. Moldovan producers have managed to produce wines with signs of geographical protection since 2015. Moldova's protected geographical indication includes 3 regions: Codru, Valul Lui Traian (hereafter referred as VLT) and Ștefan-Vodă (hereafter referred as SV). In 2016, three geographically protected names of Moldovan wines were registered in the European Union. The wines labeled with PGI are

products with specific qualities whose differentiation on the market is the key factor of their success [3]. PGI wine stands for quality products, which can enhance the quality and international awareness of Moldovan wines.

Because of the natural conditions (including soil, climate, landform, etc.) and human factors (cultivation and management methods, etc.), the wines in each region have their own characteristics. The research of Dobrei et al. showed that in the main vineyards of Western Romania terroir allows the access to quality wines, but with different characteristics, each with a designation of origin [4]. Sensory evaluation, as a widely used technical method in the food industry, can clearly distinguish wines of different origin [5]. The evaluation of food sensory characteristics or sensory characteristics provides valuable information for the food industry. Producers must understand the exact sensory characteristics of their products in order to carry out quality control and ensure that the production process meets the consumer requirements [6].

As a kind of local wine, at present, Fetească Neagră (hereafter referred as FN) wine is poorly researched. Antocea Oana Arina [7] researched 32 wines from FN, showed in good year and winemaking, it can display good potential. This experiment is a part of the project "Quality grapes". The sensory analysis of obtained wines was appreciated within the tasting commission and served to elaborate the organoleptic profile of FN wines. The network of experimental lots also serves as a tool for collecting information on wine zoning, to identify and determine the typicality of wines, based on the interactions of natural environment, climatic and soil conditions.

This experiment analyzes the sensory evaluation results of Moldovan FN wines, with the purpose of discovering the sensory characteristics of FN wines and providing reference for winery production.

Materials and methods

Samples

All 12 samples are from 3 wine regions of Moldova: 5 from experimental plots and others from wineries of Moldova. The vintages are 2017 and 2016, every chosen vintage has 6 samples.

The experimental lots are provided with standardized meteorological stations, equipped with specialized software for disease forecasting, which allow, in real time, the assessment of climatic and phytosanitary situation in the plot. The oenological potential of the harvest was determined under micro-vinification conditions.

Tasters and the applied method of tasting sheet

In this study, sensory analyses were made in 2018 at the sensory analysis

laboratory of the Technical University of Moldova. Two groups participated in the evaluation. Panel 1, composed of experts, included local (from winery and National Vine and Wine Office) and international experts, composed of 11 tasters (6 women and 5 men), aged between 32 and 65 years (average age - 42.5), 15-43 years of experience. Panel 2, composed of experts from marketing, had 7 members (3 women and 4 men), aged between 30 and 53 years, from the marketing departments of some wineries. The tasting was divided into two sessions, with the Panel 1 tasting in the morning and the Panel 2 tasting in the afternoon. The samples were prepared under the OIV review document on sensory analysis of wine (2015). Standard ISO glasses, 50-75 ml of wine in quantity, at a temperature of 18-20°C, were used.

Data statistics and analysis

For elaboration of the Table 1, 3 samples from the experimental plots and tasted by 11 authorized tasters (oenology), were used to generate descriptors for olfactory and gustatory criteria.

The analysis for construction of sensory profile was performed on 5 experimental samples and 7 samples purchased from the wineries.

The quantification of the sensory feature intensity in this article uses a 5-point scale method, that is, the perceived feature intensity, is represented by an integer from 0 to 5, and 5 is the highest score. 0 means no feeling, 1 means weak feeling, 2 means weak feeling, 3 means that the feeling is medium, 4 means the feeling is strong, and 5 means the feeling is very strong.

Tasting results of the group members were collected, to analyze the data - SPSS 22.0 was used.

Table 1. Model tasting sheet for sensory analysis of wine from FN

Таблица 1. Образец дегустационного листа для органолептического анализа вина из FN

Name	Vintage						
Data	Sample						
Olfactory	Berries	0	1	2	3	4	5
	Cherries	0	1	2	3	4	5
	Plums	0	1	2	3	4	5
	violets	0	1	2	3	4	5
	Sweet spices	0	1	2	3	4	5
	Black pepper	0	1	2	3	4	5
	Vegetable	0	1	2	3	4	5
	Lactic	0	1	2	3	4	5
	Smoke	0	1	2	3	4	5
	Oak aroma	wine	wine>oak	wine=oak	wine<oak	wine<<oak	oak
	Structure	0	1	2	3	4	5
	Volume	0	1	2	3	4	5
Gustatory	Tannin	dry			pronounced		supple
	Bitterness	0	1	2	3	4	5
	Alcohol	0	1	2	3	4	5
	Oak taste	0	1	2	3	4	5
		wine	wine>oak	wine=oak	wine<oak	wine<<oak	oak
	Taste persistence (post)	0	1	2	3	4	5
Aromatic persistence (post)	0	1	2	3	4	5	

Results and discussion

1. Sensory profile depending on the production region

According to the ANOVA analysis results of the Panel 1, FN wines in different regions showed a significant difference in vegetable notes of aroma and volume of flavor, while other sensory indicators showed no significant differences in regions.

The results of ANOVA analysis by the Panel 2 showed no difference in any of the characteristics of FN wines from different regions.

As can be seen from Fig. 1, the tannin score is the highest among all indicators of three regions, indicating that the tannin characteristics of FN wines are obvious. The scores of other indicators were not high, indicating that other sensory characteristics of FN wine were not obvious in this experiment. According to the scores of sensory indicators in the region, we can draw the following conclusion: berry and smoke tones in wines of Stefan Voda region (SV) are the best in aroma. Codru region scored higher on plum and vegetable tones of aroma than other two regions. Valulul lui Traian (VLT) region's sweet spices and black pepper flavor is the standout aroma among three regions.

In terms of flavor, three producing areas have similar performance in structure, bitterness, flavor persistence post and aromatic persistence post. The SV region in oak flavor was better than the other two regions, while alcohol was slightly weaker in three regions. The performance of the Codru region was inferior to the other two regions in tannin and volume, and no significant difference was found in other characteristics. The results of VLT region show lack of oak flavor, other characteristics have good performance.

From the Fig. 2 we can see the same result as in the Panel 1. The tannin score is the highest among all indicators of three regions, indicating that the tannin characteristics of FN wines are the most obvious.

Table 2. The results of regions, Panel 1 & 2 - ANOVA

Таблица 2. Результаты по областям, Панели 1 и 2 - ANOVA

Organoleptic characteristics	Panel 1		Panel 2	
	F	Sig.	F	Sig.
Berries	0.445	0.654	2.05	0.185
Cherries	0.227	0.802	0.163	0.852
Plums	0.294	0.752	0.458	0.647
Violets	2.562	0.132	2.647	0.125
Sweet spices	0.505	0.619	1.557	0.263
Black pepper	0.273	0.767	2.292	0.157
Vegetable	4.383	0.047*	0.532	0.605
Lactic	0.128	0.881	1.956	0.197
Smoke	0.814	0.473	0.099	0.906
Oak aroma	0.466	0.642	0.115	0.893
Structure	0.282	0.76	0.981	0.412
Volume	6.375	0.019*	0.514	0.615
Tannin	1.565	0.261	1.663	0.243
Bitterness	0.17	0.846	0.793	0.482
Alcohol	2.777	0.115	0.276	0.765
Oak gust	0.298	0.749	0.107	0.899
Taste persistence pos	0.331	0.727	2.472	0.139
Aromatic persistence pos	0.247	0.786	0.407	0.677

*P < *0.05, p < **0.01*

According to the scores of sensory indicators in the producing areas, we can draw the following conclusion: SV region has the best performance of violets and vegetable tones in aroma. Codru's berries, sweet spices and lactic flavor score is higher than in other two regions. VLT's plum and black pepper flavors are the most prominent of three regions.

Flavor characteristics show some differences between

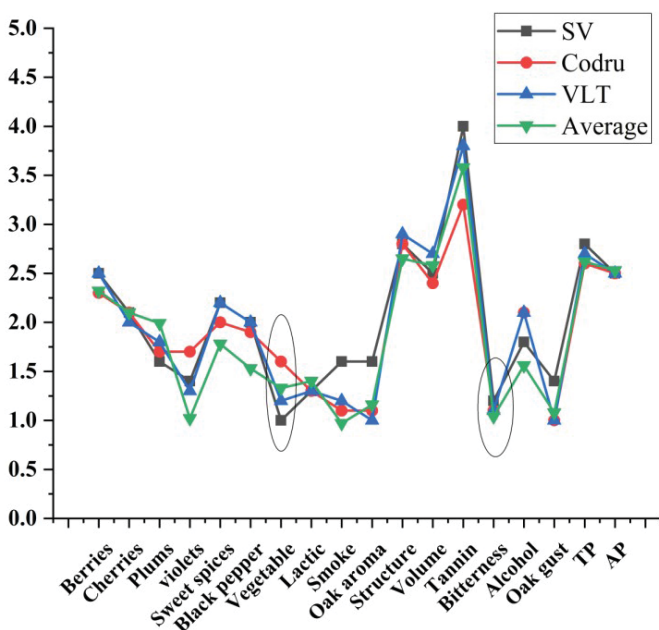


Fig. 1. Panel 1 by regions
Рис. 1. Панель 1 по регионам

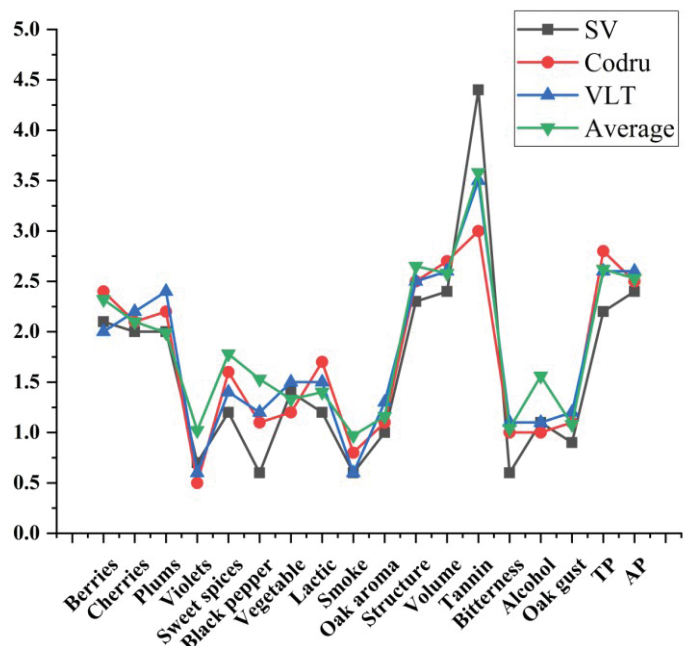


Fig. 2. Panel 2 by regions
Рис. 2. Панель 2 по регионам

three regions. The SV region performed better than other two regions on tannin, while the alcohol was slightly weaker in three other regions. Codru has oak aroma better performed than in other two regions, and tannin performed the worst of three regions. VLT region has better performance in structure and aromatic persistence post, and other characteristics performance good.

2. Sensory profile depending on the vintages

The analysis of ANOVA results of different vintages by the Panel 1 shows that there are significant differences in the following notes: berries, violets, sweet spices, lactic and oak gust, and particularly significant differences in cherries and oak aroma.

The analysis of ANOVA results from different vintages by the Panel 2 showed a significant difference in four characteristics: plums, smoke, oak aroma and bitterness, as well as particularly significant differences in oak gust from different vintages.

From the Fig. 3, it can be directly seen that the performance of 2017 vintage year in berry, cherry, violet, black pepper and lactic tones is better than that of 2016, but the performance of oak aroma and flavor is much weaker than that of 2016. Vintage of 2017 showed more fruit aromas (berries, cherries and violets) and lactic ones in two vintages. The 2016 aroma are stronger in sweet spices and smoke. Flavor of 2017 vintage year is stronger in tannins and slightly insufficient in oak flavor. The vintage of 2016 performed better at structure, volume, oak hues and flavor persistence post with more compliant tannins.

From the Fig. 4., we can intuitively see that 2017 scores higher than 2016 in addition in vegetable tones. At plums, sweet spices, smoke, alcohol, oak hues and flavor persistence post they all are weaker than vintage of 2016. Vintage of 2017 is better performed in berry and vegetable aroma than 2016, while fruit is slightly weaker. The 2016 vintage aroma is strong at plum, sweet spices and smoke.

Table 3. The results of vintages, Panel 1 & 2 - ANOVA

Таблица 3. Результаты по годам сбора, Панели 1 и 2 - ANOVA

Organoleptic characteristics	Panel 1		Panel 2	
	F	Sig.	F	Sig.
Berries	7.707	0.02*	0.738	0.411
Cherries	13.706	0.004**	0.004	0.953
Plums	0.011	0.92	13.272	0.005*
Violets	6.698	0.027*	0.385	0.549
Sweet spices	5.084	0.048*	4.366	0.063
Black pepper	0.822	0.386	0.059	0.812
Vegetable	0.08	0.784	0.54	0.479
Lactic	4.446	0.061*	0.181	0.679
Smoke	3.057	0.111	6.231	0.032*
Oak aroma	13.533	0.004**	8.204	0.017*
Structure	1.109	0.317	10	0.01*
Volume	0.357	0.563	2.311	0.159
Tannin	1.82	0.207	2.162	0.172
Bitterness	0.301	0.595	5.69	0.038*
Alcohol	0.629	0.446	0	1
Oak gust	9.261	0.012*	15.171	0.003**
Taste persistence pos	3.273	0.101	3.432	0.094
Aromatic persistence pos	0	1	3.244	0.102

$P < *0.05, p < **0.01$

As for flavor, tannins show stronger performance in the vintage of 2017, and in structure, volume, oak and flavor persistence post with more pliable tannins, the vintage of 2016 is better performed.

Conclusions

The study allowed the elaboration of original and personalized tasting sheet for appreciation of organoleptic quality of FN wines. The tasting sheet was validated during several tasting sessions with the

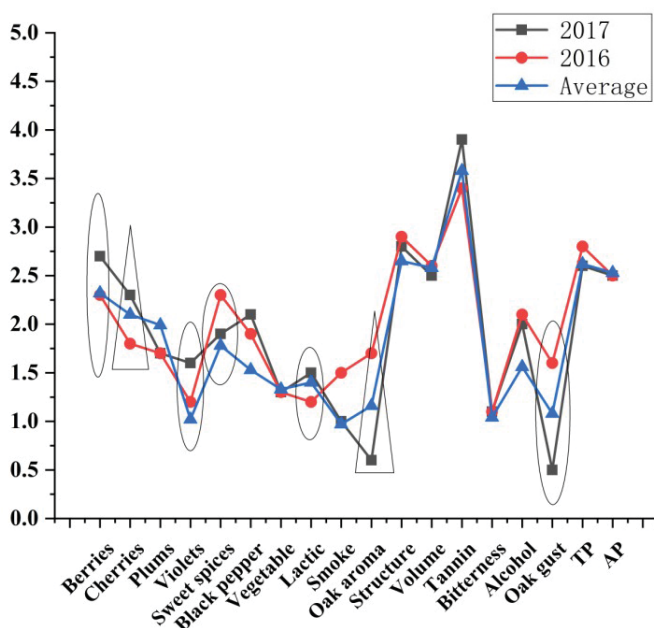


Fig. 3. Panel 1 by vintage
Рис. 3. Панель 1 по году урожая

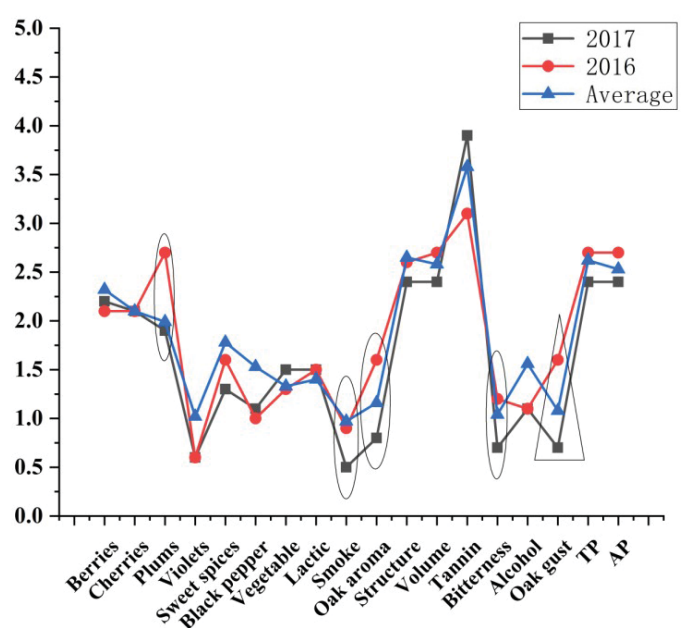


Fig. 4. Panel 2 by vintage
Рис. 4. Панель 2 по году урожая

participation of professional tasters as well as with the participation of consumers. The tasting sheet was applied to determine the typicality of wines obtained from the Fetească Neagră variety cultivated in three geographical regions and during two harvests.

Between three regions: Stefan Voda region has the best violet and vegetable tones in aroma and tannins in flavor. Berry, sweet spices and lactic flavor in wines of Codru region is performed higher than in wines of other regions, oak flavor is better than in other two regions, while tannins are the worst of three regions. In Valul lui Traian region - plum and black pepper flavors are the most prominent of three regions, also has better performance in structure and aromatic persistence post.

In different vintages: 2017 has better berry and vegetable aroma and flavor, stronger tannins. Aroma of vintage 2016 is strong at plum, sweet spices and smoke. The structure, volume, oak and flavor persistence post of vintage 2016 is better than vintage of 2017.

In this study, the sensory characteristics of FN wine have more variations in different vintages than different product areas. Through the sensory evaluation of different groups, we can get, that sensory characteristics of FN wine show more differences in vintage, and no obvious difference have been found in the region. These results do not show that the difference in three regions does not exist. The two groups evaluated tannins with the highest score, and no significant features were found in the scores of other sensory characteristics. The variety lacks a strong characteristic, we need more research and data to get the clearer identity characteristic of FN wine.

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Conflict of interests

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