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THE INFLUENCE OF TERROIR ON THE SENSORY CHARACTERISTICS OF GRAPES AND WINE OF THE TELTI-KURUK VARIETY

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Abstract. Unique wines from autochthonous varieties are much more expensive than wines from other varieties. Telti-Kuruk is an autochthonous white technical grape variety, distributed only on the territory of Ukraine. The high quality of the wine is the result of the synergy of the components of the chemical composition of the grapes when reaching technical and aromatic maturity. Sensory analysis of grape quality is a powerful tool for making decisions about harvest and use. The literature does not adequately reflect the influence of terroir on the formation of the organoleptic characteristics of the Telti-Kuruk grape variety using the methodology of sensory analysis. Physical and chemical indicators of grapes showed a significant difference between the clones of different terroirs in terms of titrated acidity; no significant difference was found in the mass concentration of sugar. The mechanical composition of the bunches of grapes confirmed the expediency of using the Telti-Kuruk variety for wine production. Sensory analysis of grapes shows that at the time of analysis, clone 7131 of Beykush winery LLC and PTK Shabo LLC, clone 7102 of PTK Shabo LLC and NSC IVIV named after V.E. Tairov have reached the aromatic maturity of the pulp and have not reached the aromatic maturity of the skin, except for clone 7102 NSC NSC «IV&V them. V.YE. Tairov». Sensory studies on creating a conditional organoleptic profile were carried out for wine from the Telti-Kuruk grape variety PTC Shabo LLC 2019, 2017, 2016, 2014, 2013, Beykush winery LLC, and PTC Shabo LLC 2020. Descriptors found in the flavor profile of grapes were observed in the flavor profile of the wine. The sensory profile of dry white wine from the Telti-Kuruk grape variety PTK Shabo LLC 2020 has intense fruit aromas, particularly quince, white peach, nectarine, and less intense floral aromas and light mineral tones. The sensory profile of the wine of the terroir of Beykush winery LLC, 2020, has a light floral aroma combined with fairly intense fruit aromas, namely white peach, and quince. The taste of both wines is characterized by good intensity, typicality, and duration of aftertaste.

Key words: grapes, wine, terroir, sensory characteristics, physical and chemical analysis, mechanical analysis.

Introduction. Formulation of the problem

In the current conditions of high market competition, wineries are constantly looking for ways to increase the prestige and demand for their wine products while maintaining high quality. One of the most important problems in the modern production of varietal wines is the production of high-quality products that meet the organoleptic characteristics characteristic of a particular grape variety. Recently, there has been a trend towards the revival of endangered autochthonous varieties, whose wines are valued much higher than those of other varieties. Such grape varieties represent a national cultural heritage, reflect centuries-old traditions and exhibit unique individual properties in finished

products. The strength of autochthonous varieties is that they perfectly reflect the terroir of the area where they were born. Wine critics Hugh Johnson and Jancis Robinson have called autochthonous varieties a global trend for the next decade [1].

Until recently, Ukrainian winemakers did not pay enough attention to such an effective quality determination as sensory analysis, while there are a huge number of sensory research centers around the world that are based on the premises of well-known universities and work independently to develop food industry, including the wine industry in their countries [2].

In the wine industry, the genetic diversity of *Vitis vinifera* cultivated grapes, combined with terroir-

specific agronomic practices, has given rise to numerous variations in the organoleptic characteristics of berries of different varieties. Technological processing of such raw materials using a variety of technological methods allows us to obtain a finished product with a unique variety of organoleptic characteristics [3].

Ukraine has great potential for the production of wine products, which demonstrate a special unique style of wine: the region of the Northern Black Sea region is attractive in all components of the terroir. Since the Ukrainian ampelographic heritage is represented exclusively by introduced varieties, the improvement of the grape sortment in different regions of Ukraine is one of the most important strategic tools for stabilizing and further intensive development of the grape and wine industry [4]. This is a confirmation that the preservation of Telti-Kuruk and bringing it to the international level is a social responsibility to the past and future generations.

Analysis of recent research and publications

Grapes are a unique plant with a characteristic plasticity of life processes that allow them to produce in sufficiently wide areas of all continents except Antarctica. However, the composition and quality of the crop are quite variable under the influence of various environmental factors, especially due to soil and climatic conditions [5]. According to many scientists, 90% of the ingredients for the success of a wine are in the vineyard and only 10% is the technology of its processing. Wine, like a mirror, reflects the variety and the place where it grows. The complex agroecological conditions are mainly the responsibility of the terroir [6]. For the future organoleptic characteristics, in addition to agroecological conditions, the maturity and quality of the grapes are responsible [7].

A modern understanding of the meaning of the term "grape quality" is very important for shaping the requirements for wine quality, as there is a close correlation between these indicators [8]. The quality of grapes and wine in general is related to the ripeness of the berries. Therefore, oenologists understand the importance of timing the harvest to produce wines of a particular style or wines that will fully reflect the characteristics of the growing area. Optimum grape maturity is a complex concept. Compounds important for wine technology are synthesized, transformed, and accumulated in the grapes during their formation and ripening periods. The high quality of wine is the result of the synergy of the components of the chemical composition of the grapes, namely aromatics, coloring compounds, tannins, and the primary metabolites – sugars and acids.

Technological maturity describes the balance between the sugars and acids in berries. These parameters are widely used in winegrowing and winemaking practices to control ripeness and determine the optimum harvesting date. The lower and upper limits of the technological ripeness parameters of grapes are

indicated in the normative documentation for the production of different types of wines.

The chemical composition of grapes has many components, its quality (the optimal ratio of components) is determined by the final task - the type/style of wine. The acidity of grapes affects the course of many biochemical processes in the production of wines, in particular, the intensity of oxidation, the dynamics of alcoholic and malolactic fermentation, and microbial stability. Low acidity negatively affects the structure of the taste of wine and is associated with such an organoleptic characteristic as "flat". High acidity due to malic acid at harvest is a sign of insufficient ripeness of the grapes and causes an aggressive, "green" taste [9,10].

The aromatic ripeness of grapes characterizes the quantitative and qualitative composition of the sensory active substances in the grapes. Wines made from grapes that have reached this type of maturity are characterized by the aroma that is characteristic of the variety. Otherwise, the premature harvesting of grapes is the reason for the absence or weak expression of varietal characteristics, and the prevalence of vegetal and "green" tones in the aromatic matrix of the wine [11,12].

The methods for determining quality (technical ripeness) vary in complexity of implementation. Modern possibilities of instrumental methods of analysis have considerably extended the list of defined components of chemical composition, however, in oenological practice, the decision on grape harvesting is based on a complex of methods: mass concentration of sugars, titratable acids, pH, phenolic complex (for red grape varieties) and its tasting evaluation [3].

Perception of the characteristics of grapes is manifested during the tasting, using our olfactory, gustatory, and sometimes visual senses. To assess a product sensorially or organoleptically means to identify and examine quality using the human senses. These days, sensory methods of assessing product quality are becoming more and more widespread. According to the definition given by the experts of the committee for sensory evaluation of the Institute of Food Technology, sensory analysis is a scientific method that is used to elicit, measure, analyze, and interpret those responses to products that are perceived through the senses.

The simplest and most convenient method for determining the aromatic maturity of grapes is to taste the skin and flesh of the grapes. The essence of the method is based on the observation that, during ripening, herbaceous aroma shifts to floral and fruity notes. With modern standardized techniques, berry sensory analysis is an effective tool for making decisions about the timing of harvesting and the direction of its use.

Scientists at the University of Stellenbosch (South Africa) have created mathematical models that allow them to predict the aromatic profile of wine, taking into

account the evolution of the colour of the skin of berries (for white varieties) or the dynamics of sugar accumulation (for red varieties) during ripening. Skin colour is considered as a parameter of maturity because of its relationship with the aromatic potential of the berry. The skin of grape berries contains carotenoids, which are biogenetic precursors of C₁₃-norisoprenoids [13-17].

Grape sensory analysis is one of the main methods for determining when grapes are harvested, along with other analyses. The specific characteristics of grape sensory analysis are based on the characteristics of the product itself, the rapid development of which has led to a deepening study of its organoleptic characteristics. In addition to identifying descriptors and establishing grape conditions, this analysis is one of the winemaker's important tools for producing high-quality wines.

Obtaining valid and reliable data is possible with sensory analysis as a "scientific tool" because humans can sometimes detect aromatics or off-flavours at levels lower than can be detected using technical analysis tools [8].

The use of autochthonous grape varieties in winemaking will enhance the competitiveness of the Odessa region. These varieties have unique properties, endowed with natural and climatic conditions of the place of growth, which produce products of demanded quality.

In recent years, interest in autochthonous varieties has increased because of the opportunity to produce unique wine products with individual qualities. These varieties can only develop their characteristics under the conditions in which they have originated and been cultivated over a long period of time. The use of autochthonous varieties ensures high quality and stable grape yields, which will allow achieving guaranteed recognition of Odessa products on the world market.

In Ukraine, the autochthonous grape variety includes the white technical variety Telti-Kuruk - a rare grape variety, the origin of which is interpreted differently in different sources. To date, Telti-Kuruk grapes are distributed only in the territory of Ukraine.

Telti-Kuruk is a rare grape variety, the origin of which is interpreted differently in different sources. In the book "Ampelography of the USSR. Less common grape varieties" origin and time of appearance of the variety in the culture has not been established [7]. To date, the Telti-Kuruk grape variety is distributed only on the territory of Ukraine and is presented in the form of two clones, namely clone 7131 and clone 7102, which differ from each other in their ampelographic and physicochemical parameters.

Clone 7131 has medium-sized bushes, leveled in productivity, the yield is stable, significantly higher than the average variety; clusters of elongated cylindrical-conical shape with wings, one-dimensional, medium density; slightly oval-shaped berries, uniform in bunches, light green, slight pea in dry years. The clone is characterized by high sugar accumulation and

constant acidity. Resistance to fungal diseases is higher than that of the variety.

Clone 7102 has medium-sized bushes, leveled in productivity, the yield is stable, significantly above the average of the variety; clusters of elongated conical shape, one-dimensional, dense; slightly oval-shaped berries, uniform in bunches, light green, slight pea in dry years. Resistance to fungal diseases is higher than that of the variety.

The two clones have an average yield and an average brush size. Their direction of use involves the production of high-quality high-quality table white wine and champagne wine material. Light straw color with a golden hue, bright floral aroma, harmonious taste, and full enough (clone 7102 adds piquancy). According to the sugar content of berry juice, clones had different values: clone 7131–194 g/dm³ and clone 7102–186 g/dm³ [18].

The influence of terroir on the formation of organoleptic characteristics of various grape varieties has been consecrated by a sufficient number of works, however, the Telti-Kuruk grape variety in this aspect has not been studied enough using modern sensory analysis methodology.

The purpose and objectives of the study. The purpose of the work is to study the sensory characteristics of grapes and wines of the Telti-Kuruk variety in various terroirs of Ukraine.

The **objectives** of the research were:

1. studying the physicochemical parameters of grapes and wine
2. researching of the mechanical composition of grapes,
3. researching the sensory characteristics of grapes and wine of the Telti-Kuruk variety in different terroirs of Ukraine;
4. studying of the dynamics of transformation of primary aromas of wine from grapes of the Telti-Kuruk variety during aging.

Research materials and methods

Materials of research: grape variety Telti-Kuruk produced by NSC «IV&V them. V.YE. Tairov», Beykush winery LLC, PTC Shabo LLC and wine from the grape variety Telti-Kuruk, producers Beykush winery LLC and PTC Shabo LLC, Ukraine.

Experiments were carried out on clones of the Telti-Kuruk variety, namely clone 7102 and clone 7131 on the plots of the viticulture department of the NSC «IV&V them. V.YE. Tairov», PTK Shabo LLC, Beykush winery LLC in 2019-2020.

Telti-Kuruk grape bushes from the Tairov terroir 2014 planting. The territory of the experimental site is located in the central part of the Odessa region on the eastern bank of the Sukhoi Estuary; according to soil and climatic parameters, this territory belongs to the zone of the southern steppe. The soil cover is represented by typical southern plantation chernozems, which are formed on a pale-yellow forest. Type of

formation of bushes - border, planting pattern 3x1.5m, loading bushes with eyes, shoots and clusters proportional to the strength of the growth of bushes.

Grape bushes of the Telti-Kuruk variety, Beykush terroir 2016 planting. Experimental plot located on dark chestnut residual weakly solonchous large-saw-medium loamy soils in forests. The experimental site is located a few hundred meters from the sea and is surrounded on three sides by water constantly blown by the wind. Type of molding bushes one shoulder Guyot, planting pattern 1x2.5 m, stock Kober 5BB.

Telti-Kuruk grape cultivars of Chabo terroir 1978 planting. The territory of the experimental plot is located on the left bank of the Dniester estuary, which has a specific impact on the microclimatic features of the vine growing plots. Soil-forming rocks are represented mainly by ancient alluvial sediments, pre-Quaternary sands, and the estuary bank by modern layered sandy sediments. Type of shrub formation single-shoulder Guyot, planting pattern 1x2.5m

The experiment was set up in triplicate, with 45 accounting bushes in each variant, 15 in repeatability. Grapes from the bushes were collected separately for physicochemical analysis.

Sensory studies on the creation of a conditional organoleptic profile for wine from the Telti-Kuruk grape variety were carried out using the example of wines of the same terroir of different years (2013-2019) of PTK Shabo LLC, and terroirs Beykush winery LLC 2020, PTK Shabo LLC 2020.

The influence of terroir on the sensory characteristics of wines from different terroirs was studied on wines of 2 terroirs: PTK Shabo LLC, between the Black Sea and the Dniester estuary, and Beykush winery LLC, the left bank of the Dniester estuary.

Methods of research. The mass concentration of sugar in berry juice was determined according to DSTU 7669:2014, in wine according to DSTU 4112.5, titrated acids in berry juice and in wine – according to DSTU GOST 14252:2009. Determination of the mechanical composition of grapes was carried out according to the method of M.M. Prostoserdov, which involves the selection of typical for this variety in size, shape, and density of bunches, having healthy berries [19]. When creating sensory profiles we used the method of profiling DSTU ISO 6564:2005. The flavour profile method describes the overall impression of the product in terms of five main criteria: the nature of the descriptors, their intensity, the order of appearance of these descriptors, the aftertaste, and their completeness (the phenomenon expressed by the overall impression of the combination of the product components). The profile method is based on the fact that individual taste, smell, and other stimuli combine to give a qualitative definition of the product's taste and identify the aroma and flavour elements that are most characteristic of the product, giving it a flavour profile. By means of the international standard ISO 8586:2019, the criteria for expert selection were established.

The influence of agrotechnical cultivation methods on the sensory characteristics and physicochemical parameters of experimental samples of grapes and wine was studied using the method of one-way analysis of variance, the method of principal components (Analysis of Variance, ANOVA; two-way ANOVA; Principal Component Analysis, PCA) in the MS software environment Excell 2010 StatisticaStatsoftver 7.0 [20].

Results of the research and their discussion

The study identified minor differences between the variants in the physicochemical parameters of Telti Kuruk grapes. The highest mass concentration of sugar in clone 7131 was observed in the grapes from the terroir «Beykush winery» and was 220 g/dm³, which was 36.4 g/dm³ higher than in the terroir of the NSC «IV&V them. V.YE. Tairov» and 39.8 g/dm³ lower respectively in the terroir of PTK Shabo LLC. The difference between this experiment variant is mathematically proven by NSR₀₅ = 21.4 g/dm³. There was no significant difference between the experimental samples of terroirs of Beykush winery LLC and PTK Shabo LLC in the mass concentration of sugars in the juice of the Telti Kuruk grape variety (Table 1).

According to clone 7102, no significant difference in the mass concentration of sugars in the juice of grape berries in the conditions of the terroirs of Beykush winery LLC and PTK Shabo LLC was found. The mass concentration of sugar in the terroir of the PTK Shabo LLC is 16.1 g/dm³ higher than in the terroir of the NSC «IV&V them. V.YE. Tairov», the difference is not mathematically proven HCP₀₅ = 16.7 g/dm³ (Table 1).

A similar situation was observed in terms of titratable acids. A significant difference was only obtained when grapes were grown under the conditions of PTK Shabo LLC terroir, where the mass concentration of titratable acids was 8.2 g/dm³ and 7.8 g/dm³, according to clones 7131 and 7102. The difference was not significant between the other test samples (Table 1).

Table 1 – The influence of terroir conditions on the physicochemical parameters of the Telti-Kuruk grape variety, average for 2019-2020

| Sample name | | Mass concentration of sugar, g/dm ³ | Mass concentration of titrated acids, g/dm ³ |
|---------------------|---------------------|--|---|
| CLON E 7131 | Tairov | 183.6 | 6.7 |
| | Beykush | 220.1 | 6.0 |
| | Shabo | 180.3 | 8.2 |
| HCP ₀₅ * | | 21.4 | 1.4 |
| CLON E 7102 | Tairov | 207.2 | 6.4 |
| | Shabo | 191.1 | 7.8 |
| | HCP ₀₅ * | 16.7 | 1.7 |

* Mathematical data processing was carried out using the Dispersion one-factor method. NSR (smallest significant difference), if the difference according to the test options is less than or equal to the calculated number of NSR, then it is mathematically proved by 95% (0.5 is the accuracy of the experiment).

As you know, a bunch of grapes consists of a comb and berries, and a berry, in turn, consists of a skin, pulp with juice, and seeds. The percentage by weight of these constituents is not the same for different grape varieties and is established by mechanical analysis of grapes and berries. Data on the mechanical composition of bunches and berries make it possible to judge the greatest expediency of using this grape variety.

According to the results of the experiment with clone 7131, the largest average weight of the bunch is represented by the terroir of PTK Shabo LLC, it is 257.9 g, of which 199 g is the weight of pulp with juice. The lowest average weight of the bunch of this clone was observed in grapes produced by NSC «IV&V them. V.YE. Tairov». -81.7 g lower than in the production under conditions of PTK Shabo LLC. Under the conditions of Beykush winery LLC the average weight of the bunch was 184.7 g (Table 2).

Table 2 – The influence of the conditions of different terroirs on the mechanical composition of grapes of the Telti-Kuruk variety, the average of 2019-2020

| Mechanical composition of bunches and berries | Clone 7131 | | | Clone 7102 | |
|---|-------------------------------|---------------|--------------------|-------------------------------|---------------|
| | NSC «IV&V them. V.YE. Tairov» | PTK Shabo LLC | Beykush winery LLC | NSC «IV&V them. V.YE. Tairov» | PTK Shabo LLC |
| The average weight of the bunch, g | 176.2 | 257.9 | 184.7 | 195.1 | 170.5 |
| Number of berries in a bunch, pcs | 163 | 176 | 140 | 161 | 102 |
| The number of seeds in a bunch, pcs | 256 | 169 | 243 | 198 | 157 |
| Mass of berries, g | 167.4 | 249.6 | 176.7 | 187.1 | 164.1 |
| Comb mass, g | 8.8 | 8.3 | 7.9 | 8 | 6.4 |
| Weight of skin, g | 19.3 | 42.8 | 24.8 | 32.6 | 22.7 |
| Weight of seeds, g | 8.8 | 7.8 | 8.3 | 9.9 | 6.5 |
| Mass of pulp with juice, g | 139.4 | 199 | 135.7 | 144.6 | 134.8 |
| Mass of solid residue, g | 36.8 | 58.9 | 41 | 50.5 | 35.7 |

* Mathematical data processing was carried out using the Dispersion one-factor method. NSR (smallest significant difference), if the difference according to the test options is less than or equal to the calculated number of NSR, then it is mathematically proved by 95% (0.5 is the accuracy of the experiment).

In clone 7102, on the contrary, the largest average weight of the bunch is represented by the terroir of the NSC «IV&V them. V.YE. Tairov», it is 195.1 g, of which 144.6 g is the weight of the pulp and juice, the average weight of the bunch was 170.5 g for the grapes under the conditions of PTK "Shabo" LLC. The difference in the weight of the bunch for both clones is significant,

NSR05 = 9.83 g for clone 7131, NSR05 = 14.76 g, respectively, for clone 7102.

A similar situation occurred in terms of the number and mass of berries in a bunch. When comparing the average mass of the bunch of two clones on the terroir of PTK "Shabo" LLC, we observe higher indicators in clone 7131–257.9 g (clone 7102–170.5 g). When comparing the average weight of the bunch of two clones on the terroir of the NSC «IV&V them. V.YE. Tairov», higher indicators are observed in clone 7102–195.1 g (clone 7131–176.2 g).

According to the preliminary data, we can note that each clone has different mechanical characteristics due to the influence of different terroirs. The results of the research can be used to identify the influence of terroir on different clones of the Telti-Kuruk grape variety and the further use of a particular clone in a particular area.

In scientific and methodological publications, chemical methods for controlling the phenolic maturity of grapes are most fully presented, however, the literature shows significant drawbacks of the above methods: complexity, time-consuming analysis and low reliability of the results due to their variability depending on growing conditions and genetic characteristics of the variety [21,22].

In recent years, in order to control phenolic maturity, oenologists have increasingly used protocols based on the sensory evaluation of berries. The essence of the method is based on the observation of the color change of the skin and seeds, the ability to destroy and the perception of tannins in the oral cavity. Sensory analysis allows to trace the evolution of the phenolic potential of grapes and to optimize the harvest date.

The best-known method of sensory analysis of grapes was developed by researchers at the Institut Cooperatif du Vin (Montpellier, France), which is a recognized tool for choosing the optimal harvest date. This tool, which includes 20 descriptors and is evaluated in the interval from 1 to 4, makes it possible to understand the level of fruit maturity and to associate it with its descriptive characteristic [17]. This methodology was developed for a global approach to the qualitative potential of the crop, providing control from grape to wine. Sensory analysis focuses on three berries that are tasted simultaneously and by segment: visual and tactile assessment of berries, pulp and skin analysis, visual inspection and tasting analysis of seeds. Experience and a data bank for the interpretation of results allow us to bring analytical data on grapes and wine closer to sensory characteristics.

Clone 7131, which is represented by three different terroirs of Ukraine, has its own organoleptic indicators in each case. According to a visual assessment, the data are almost the same. The sweetness and acidity of the pulp are high in the terroir clone of PTK Shabo LLC. The indicators of the skin are characterized by almost identical points. The seed parameters are similar in the terroirs of the NSC «IV&V them. V.YE. Tairov» and PTK Shabo LLC. Grape seeds of Beykush winery LLC are

characterized by higher indicators, in addition to the tendency of seeds to be destroyed.

According to the data presented, clone 7102 differs in organoleptic characteristics in the conditions of different terroirs of the NSC «IV&V them. V.YE. Tairov» and PTK Shabo LLC. The obtained results demonstrate more intensive indicators in the conditions of the terroir of PTK Shabo LLC by visual assessment and pulp assessment. As for the skin, the data obtained are almost identical, except for the intensity of the dominant aromas of the skin, which is 1.8 times higher in the terroir of Shabo LLC. According to the evaluation of seeds, the organoleptic evaluations also differ.

The data show that the grapes of the Telti-Kuruk variety, which is represented by two clones, exhibit different organoleptic characteristics in different terroirs. This confirms that the characteristics of grapes are particularly influenced by the place of their cultivation, i.e. terroir.

According to the results of the data obtained, under the conditions of the NSC «IV&V them. V.YE. Tairov» clone 7131 has a higher visual score than clone 7102. In terms of fleshiness, adhesion aspect, acidity and aroma intensity of the flesh, clone 7131 scored higher, while the sweetness and aroma of the flesh were similar in both clones. The organoleptic characteristics of the skin are almost identical, except for the tartness and dryness of the tannins (twice as high for clone 7102). The seed grade is almost identical in the two clones, except for seed tendency to shatter (higher in clone 7102) and seed tartness (higher in clone 7131).

In the conditions of the terroir of PTK Shabo LLC, clone 7102 has a visual assessment with higher indicators.

In terms of pulp, adhesion aspect and aroma intensity, clone 7102 has higher indicators, and the acidity of the pulp in clone 7131. Organoleptic indicators, in addition to the intensity of the dominant aromas of the skin, which are 0.8 more in clone 7102. The seed score for each indicator differs between the two clones: clone 7131 scores higher in terms of seed color and astringency, and clone 7102 differs in seed tannin aroma.

A generalized interpretation of the obtained results of the Telti-Kuruk grape variety shows that at the time of analysis, clones 7131 of Beykush winery LLC, clone 7131 of PTK Shabo LLC, clone 7102 of PTK Shabo LLC and clone 7102 of NSC «IV&V them. V.YE. Tairov» are mature in terms of aromatic maturity of the pulp and have not reached the aromatic maturity of the skin, except for clone 7102 NSC «IV&V them. V.YE. Tairov» (Table 3).

Technological maturity and maturity of tannins are not at a high level in all samples. The data confirm that the grapes at the time of the study were suitable for the production of medium quality wines using adapted technological methods. A possible solution to the problem was to postpone the harvest date in order to achieve the maximum score for all organoleptic indicators of the grapes. Such grapes, which score 4 in all aspects, will be fully mature and can be used for the production of high-gamut wines. Wine from this variety, today, is produced only in Beykush Winery LLC and PTK Shabo LLC.

On the example of the wines of PTK Shabo LLC, sensory studies were carried out to create a conditional organoleptic profile for wine from the Telti-Kuruk grape variety of the same terroir of different years (2013–2019) (Fig. 1).

Table 3 – Interpretation of the results of the sensory evaluation of Telti-Kuruk grapes, 2019

| Experimental plots | Technological maturity | | | | Aromatic maturity of the pulp | | | | Aromatic maturity of the skin | | | | Maturity of tannins | | | |
|-------------------------------|------------------------|-----|-----|-----|-------------------------------|---|-----|---|-------------------------------|-----|---|---|---------------------|-----|-----|---|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| NSC «IV&V them. V.YE. Tairov» | | 2.3 | | | | | 3 | | | 2.6 | | | | 2.2 | | |
| Beykush winery LLC | | 2.3 | | | | | 2.8 | | | 1.8 | | | | 2.6 | | |
| PTK Shabo LLC, CLONE 7102 | | | | 2.6 | | | 3 | | | 1.5 | | | | 2.3 | | |
| PTK Shabo LLC, CLONE 7131 | | | 2.5 | | | | 3 | | 1 | | | | | | 2.5 | |

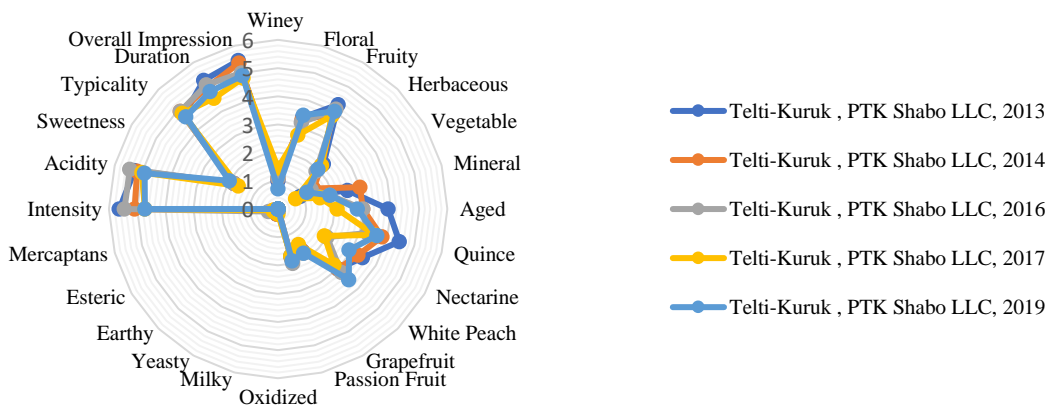


Fig.1. Generalized flavor profile of wine from the Telti-Kuruk grape variety OOO PTK Shabo 2019, 2017, 2016, 2014 and 2013

All experimental samples of wine from the Telti-Kuruk terroir of PTK Shabo LLC, located between the Black Sea and the Dniester estuary, are represented by the same descriptors, close in intensity, allowing to determine the original sensory profile of wines from a separate terroir. In terms of overall impression, the highest rating was given to the wine - "Telti-Kuruk" PTK Shabo LLC in 2013, which suggests that the wine from this variety shows its original properties better at a more mature age due to the descriptors of the inherent tritertiary aromas (Fig. 1).

To study the influence of terroir on the sensory characteristics of wines from different terroirs, a study was made of wines from 2 terroirs: PTK Shabo LLC between the Black Sea and the Dniester Estuary and

Beykush winery LLC, the left bank of the Dniester Estuary (Fig. 2-3).

Sensory profile of dry white wine from the Telti-Kuruk grape variety of the terroir of Beykush winery LLC 2020. has a light floral aroma combined with fairly intense fruit aromas, in particular white peach and quince; the taste of the wine is characterized by good intensity, typicality and duration of the aftertaste.

The sensory profile of dry white wine from the Telti-Kuruk grape variety PTK Shabo LLC 2020 has fairly intense fruit aromas, in particular quince, white peach, nectarine and less intense floral aromas, light mineral tones are also observed; the taste is fresh, with high acidity, intense, typical of the variety, has a good duration.

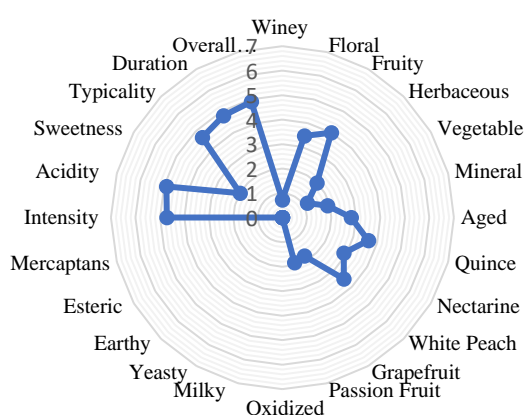


Fig. 2. Generalized flavor profile of wine from Telti-Kuruk grape variety Beykush winery LLC 2020

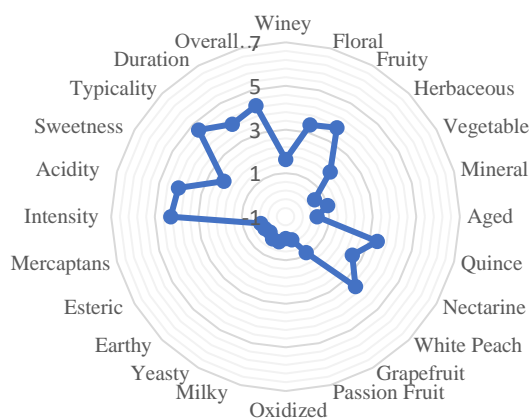


Fig. 3. Generalized flavor profile of wine from Telti-Kuruk grape variety PTK Shabo LLC 2020

Conclusion

The study of the influence of terroir features on the organoleptic characteristics of grapes and wine, in particular autochthonous varieties, is quite relevant at the present time, but there are not enough studies of Ukrainian terroirs in scientific sources.

Studies of the physico-chemical parameters of grapes from three different terroirs of Ukraine, which differ significantly in terms of agro-ecological conditions, show that the differences are within the accepted requirements in the production of table wines. Based on these indicators, it is impossible to draw conclusions regarding the influence of terroir conditions on the quality of indicators.

Studies of the mechanical composition of the Telti-Kuruk grape variety make it possible to establish the difference between the quality of grapes under the conditions of the studied terroirs. The difference between the clones in the conditions of the same terroir was also established.

The study of the complex of organoleptic indicators of the Telti-Kuruk grape variety made it possible to establish its flower-fruit direction with a predominance of the original taste-aromatic descriptors inherent in the variety, in particular, white flowers of fruit trees, quince, white peach and nectarine.

The descriptors found in the flavor profile of the grape were also observed in the flavor profile of the wine made from this grape variety. Thus, the description of the organoleptic characteristics of grapes and wine using sensory analysis methods is not only not inferior, but often surpasses chemical methods in terms of the ability to detect flavor and aroma components of the organoleptic profile.

The study of the evolution of primary aromas during aging of wine shows that the autochthonous grape variety Telti-Kuruk has a high level of persistence of primary aromas even during long periods of bottle aging. Studies show a steady increase in tertiary flavors with almost unchanged primary flavors.

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ВПЛИВ ТЕРУАРУ НА СЕНСОРНІ ХАРАКТЕРИСТИКИ ВІНОГРАДУ ТА ВІНА СОРТУ ТЕЛТІ-КУРУК

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Анотація Унікальні вина з автохтонних сортів цінуються набагато дорожче за вартістю ніж вина з інших сортів. Тельті-Курук – це автохтонний білий технічний сорт винограду, поширений тільки на території України. Висока якість вина є результатом синергії компонентів хімічного складу винограду при досягненні технічної та ароматичної зрілості. Сенсорний аналіз якості винограду – це дієвий інструмент для прийняття рішень про збір урожаю та напрям його використання. В літературі не висвітлено в достатній мірі вплив теруару на формування органолептичних характеристик винограду сорту Тельті-Курук з використанням методології сенсорного аналізу. Фізико-хімічні показники винограду показали суттєву різницю між клонами різних теруарів за титрованою кислотністю; за масовою концентрацією цукру суттєвої різниці не виявлено. Механічний склад грон винограду підтвердив доцільність використання сорту Тельті-Курук для виробництва вина. Сенсорний аналіз винограду демонструє, що на момент аналізу клон 7131 ТОВ «Бейкуш Вайнері» та ТОВ ПТК «Шабо», клон 7102 ТОВ ПТК «Шабо» та ННЦ «ІВіВ ім. В.Є. Таїрова» досягли ароматичної зрілості м'якоті та не досягли ароматичної зрілості шкірки окрім клону 7102 ННЦ «ІВіВ ім. В.Є. Таїрова». Сенсорні дослідження зі створення умовного органолептичного профілю проведено для вина з винограду сорту Тельті-Курук ТОВ ПТК «Шабо» 2019, 2017, 2016, 2014, 2013 років, ТОВ «Бейкуш Вайнері» та ТОВ ПТК «Шабо» 2020 року. Дискриптори, які знайдено у смако-ароматичному профілі винограду спостерігались у смако-ароматичному профілі вина. Сенсорний профіль білого сухого вина з винограду сорту Тельті-Курук ТОВ ПТК «Шабо» 2020 р. має інтенсивні фруктові аромати, зокрема айви, білого персика, нектарину, та менш інтенсивні квіткові аромати та легкі мінеральні тони. Сенсорний профіль вина теруара ТОВ «Бейкуш Вайнері», 2020 р. має легкий квітковий аромат у поєднанні з досить інтенсивними фруктовими ароматами, зокрема, білого персика та айви. За смаком обидва вина мають гарну інтенсивність, типовість та тривалість післясмаку.

Ключові слова виноград, вино, теруар, методологія, сенсорна характеристика, фізико-хімічний аналіз, механічний аналіз