ORIGINAL ARTICLE

Prospects for the Use of Wine of Ukrainian Producers for Creation of Parapharmaceuticals

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Abstract

Introduction: The purpose of this paper is an analysis of raw materials stock and variety of Ukrainian wines, investigation of general chemical composition, and prospects for the use of wines of Ukrainian production for creation of new parapharmaceutical substances. **Materials and Methods:** Logical and analytical methods were used for the data analysis of the specialized literature and normative legal documentation related to the classification of types, variety, and chemical composition of wines that are available on the Ukrainian market. **Research Results:** The basic stock of raw materials, groups, and types of wines of the Ukrainian producers, chemical composition of red wine was analyzed, a comparative analysis of chemical composition of red and white wine was done. The data of the researches accomplished by us testify to topicality of the development for creation of new parapharmaceuticals on the basis of table red wine. **Conclusions:** On the basis of the fulfilled analysis, it was established that there is a sufficient stock of raw wine materials in Ukraine, the largest area (66.4%) is occupied by vineyards in the south of Ukraine, in particular, in Odessa, Kherson, and Mykolaiv regions. On the basis of the fulfilled analysis, for further research work, genuine wines with minimum content of sugar and alcohol (table and dry ones) made from the same grapes cultivar (ordinary), containing the highest amount of active substances that exhibited an antioxidant, anti-inflammatory, and regenerative effect in the agents under development and promoted the renewal and moisturizing of the skin, were selected.

Key words: Antioxidant substances, chemical composition of wine, table wines, wine therapy, wine variety

INTRODUCTION

In recent years, wine therapy is being developed actively in many leading countries of the world such as France, Italy, Spain, and others. Wine therapy is used for the production of various parapharmaceutical products which contain grape oil, extracts from various grape derivatives, as well as extract of wine yeasts and genuine wine.[1-5] Introduction of wine in the composition of parapharmaceuticals is the latest and most promising trend of development. The wine contains a large amount of vitamins, phenolic compounds, organic acids, as well as substances with antioxidant effect, it's these substances that help to keep the skin smooth and beautiful, exhibit regenerative and anti-inflammatory effect.[6-9]

The created wine-based parapharmaceuticals have a powerful rejuvenating and regenerating effect, they tone up and strengthen, moisturize, and vitaminize skin, improve blood circulation in vessels, assist in the removal of toxins, and help for the treatment of cellulitis and body fitness.[10]

The purpose of this paper is an analysis of raw materials stock and variety of Ukrainian wines, investigation of general chemical composition, and prospects for the use of wines of Ukrainian production for creation of new parapharmaceutical agents with an antioxidant, anti-inflammatory, and regenerating effect.

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MATERIALS AND METHODS

In this paper, logical and analytical methods were used for the data analysis of the specialized literature and normative legal documentation related to classification of types, variety, and chemical composition of wines that are available on the Ukrainian market.

RESULTS AND DISCUSSION

Viniculture is a sufficiently developed industry in Ukraine. Approximately 60,000 hectares, i.e., 1% of all agricultural land (0.1% country's territory) are occupied by vineyards which are located mainly in the south of the country in Odessa, Kherson, and Mykolaiv regions, and as well as in Transcarpathia [Figure 1].

As it can be shown from Figure 1, the largest area (66.4%) is occupied by vineyards in the Odessa region, where there are the most favorable climatic conditions for them and the smallest (8.3%) in the Transcarpathian region.

Thus, all the largest wine processing plants ("Koblevo," "Shabo," "Colonist," Prince P.N. Trubetskoy's wine-making farm, "Wines of the Guliyevs") are located in the south of Ukraine, and small wine processing enterprises ("Cotnar" and "Chizai") are located in the west.

Today, many varieties of grapes are grown in Ukraine, which are considered to be basic in the wine industry. Vineyards of Ukraine provide raw materials for the production of such famous wine brands as "Cabernet," "Sauvignon," "Merlot," "Pinot Noir," etc.

In accordance with the Law of Ukraine "On grapes and grape wine" and in accordance with DSTU 4806:2007 "Wines. General technical conditions" and DSTU 2164-93 "Grape wines. Terms and definitions" wines are divided into:

- Blended wines are wines that are made by mixing different wine materials (according to the grape variety, growing area, year of harvest, type, and quality) or with the components prescribed by the technological instructions to provide the typical characteristics of that wine, to improve its organoleptic properties, ensuring production of homogeneous wines as for their organoleptic and physicochemical characteristics.
- Prototype is a traditional type of wine that historically appeared as a result of geographical specifics of the area, grape variety, technology for its processing, and specific processing techniques for grapes, pulp or wine material, and served as a prototype (sample) for the production of the corresponding type of wine in one or another viniculture area.
- Ordinary seasoned wines are wines of improved quality, which are made according to the generally accepted or special technology from wine materials of certain types of grapes or their mixture, with obligatory seasoning in oak containers for at least 6 months before the bottling.

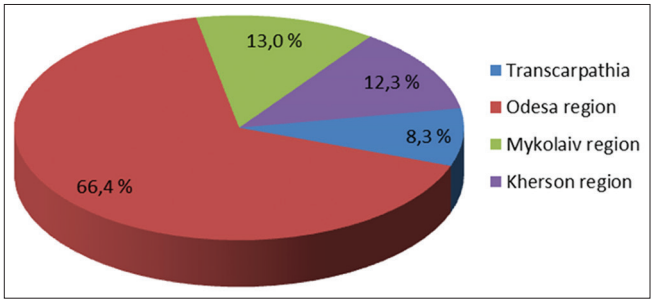

Figure 1: Vineyard area in different regions of Ukraine, %

According to the color, wines are divided into white, pink, and red. Furthermore, grape wines are classified according to their content of ethyl alcohol and sugar, namely dining (dry, semi-dry, and semi-sweet) and fortified (strong and dessert - sweet, liqueur).

Wines according to their quality and duration of seasoning are divided into young (dining only), ordinary, vintage ones, and collectibles.

The general characteristics of wines according to groups and types are given in Table 1.

Based on the analysis of groups and types of wines of Ukrainian producers, for further research, we selected genuine wines with a minimum sugar and alcohol content (dining, dry) and made from one grape variety (ordinary).

It is inexpedient to add alcohol-rich wines to parapharmaceuticals due to the fact that alcohol will cause a locally irritating effect and affect rheological characteristics. An increase of sugar content in the composition of the product is undesirable as well because it will be reflected in the structural and mechanical properties of the product under development and will increase the percentage of preservatives contained in the product. The use of blended wines will make it difficult to analyze the composition of the wine.

Dining wines, as compared to the other ones, have the finest taste and aroma because the relatively small content of sugar and alcohol does not suppress all tinges of taste and scent. However, the low alcohol content leads to relatively short time storage of these wines; therefore, the process of preparation, bottling, and storage of dining wines requires special conditions (lower temperatures).[11,12]

A variety of dining wines are wines made in a Kakhetian way. During the production, the juice ferments together with pulp and grape clusters, that is why a large number of tannins and other substances get into the must, which accounts for a greater antioxidant activity of the wine.

Table 1: Characteristics of wines according to their groups and types

Group and type of wine	Description of the sort of wine	Sorts of wine
Dining (content of alcohol – 8–16%)		
Dry (content of sugar up to 0.3 g/100 ml)	Always natural. They are made from wine materials produced by the method of full fermentation of sugars of grape must or pulp without adding alcohol	Dry vintage - "Aligote," "Cabernet," "Riesling," "Gurjaani," "Rkatsiteli," "Sauvignon," "Chardonnay," and others; Dry ordinary - Aligote, Cabernet, Muscat, Merlot, Rkatsiteli, Saperavi, and Sauvignon
Semi-dry (content of sugar 0.5–2.5 g/100 ml) and Semi-sweet (content of sugar 3.0–8.0 g/100 ml)	They are made from wine materials produced by partial fermentation of sugars of grape must or of pulp stopping the fermentation. Wines can be made by blending dry wine materials and a concentrate of grape juice or preserved must	Semi-dry - "Monastic star," "Silvaner semi-dry," "Semi-dry white," and "Semi-dry pink;" Semi-sweet - "Sauvignon," "Black pearls," "Whisper of the monk," "Bear blood," "Cadarka," "Muscat," "Semi-sweet white," and "Semi-sweet pink"
Strong (content of alcohol - 17–20%, of sugar 3.0–14.0 g/100 ml)	They are made from wine materials produced by the method of full or partial fermentation of sugars of grape must or pulp and stopping the fermentation by adding rectified ethyl alcohol, made from starch-maltose-based raw materials and grape-processed products	Strong vintage - "Madeira the Crimean," "Marsala," "Red Port," "Bunch of Transcarpathia," "White Port Sourozh," "Jerez Dagestan," and others; Strong ordinary - "Ruby of Transcarpathia," "Madeira," "White Port," "Agdam," "Jerez Strong," "Strong White," "Strong Pink," "Primorsk," and "Slavonic"
Dessert (content of alcohol - 14–17%, of sugar 5.0–35.0 g/100 ml)	They are made from wine materials produced by the method of incomplete fermentation of grape must, after infusion of sugar abundant (24–40%) grape pulp, (stopping the fermentation by adding ethyl alcohol)	Vintage - "Ukrainian Cahors," "Gabriela," "Golden Field," "South Coast Cahors," "White Muscat," "Red Stone," and "Black eyes;" ordinary - "Isabella," "Sun in a goblet," "Golden Coast," "White Muscat," "Rkatsiteli," "Jaus," "Cahors," and "Saperavi."

According to the literary data, white and red wines differ in their chemical composition and the ratio of mineral and organic substances,[2,13,14] which are given in Table 2.

Table 2: Correlation of mineral and organic substances of must and groups of wine, %

Substance	Must	Red wine	White wine
Water	80.3	88.4	89.4
Mineral substances	0.4	0.3	0.2
Organic substances	19.3	11.3	10.4
Ethyl alcohol	Traces	9.6	8.8

It is known that grape wine has an extremely complex chemical composition [Figure 2], which numbers >600 organic and inorganic substances.[15-17] The ingredients that are part of the wine can be divided into groups.[18-21]

- Compounds that come to wine from grapes: Water, bound acids, sugars, phenols, pectins, nitrogen-containing compounds, mineral compounds, enzymes, aromatics, and vitamins.
- Compounds formed during the fermentation of alcohol: Ethanol, higher and polyhydric alcohols, bound and free

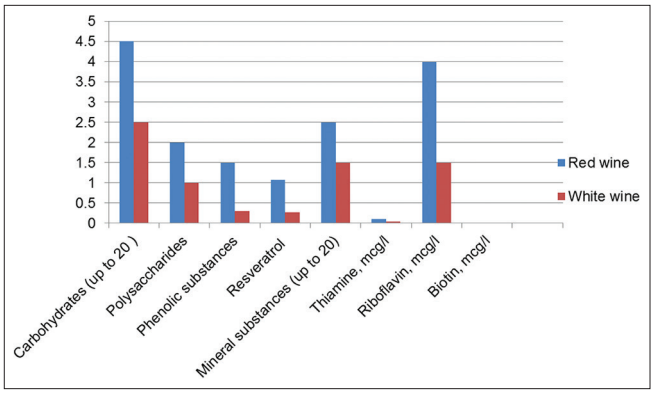

Figure 2: Comparative analysis of the chemical composition of red and white wine, g/l

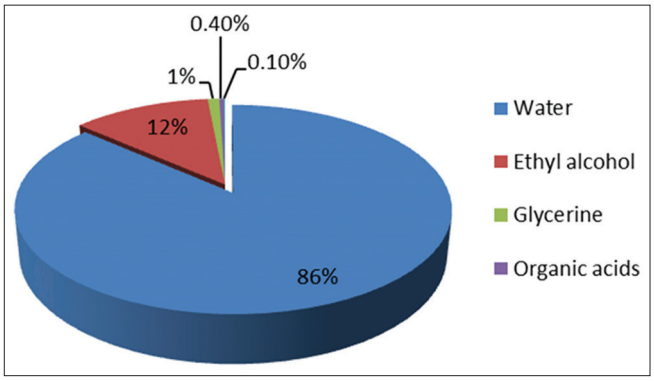

Figure 3: General chemical composition of red wine, %

acids, ketones, aldehydes, esters, and carbon dioxide.

- Compounds added to wine during fermentation: Sulfur dioxide; components that are formed during maturation of wine: Organic acids - products of acid apple-lactic and acetic fermentation.

As it can be seen from the data of the comparative diagram in Figure 2, red wines contain a significantly higher concentration of active substances than white ones. Red wines are 5 times richer in phenolic compounds, in particular, they are rich in resveratrol, which has antioxidant activity. In addition, Vitamins B (biotin, thiamine, and riboflavin), that are necessary for the skin to function properly as well as prevent the development of dermatitis, xerosis, and reduce manifestations of aging, are much more concentrated in red wine.

Young dining wines are enriched with vitamins and enzymes to a greater extent. Red wines have about 2 times more vitamins than white ones because the solid particles of berries enrich the must with Vitamins B2, B5, and B6, as well as with bioflavonoids that protect the whole complex of vitamins against destruction.[20-22]

It is proved that the concentration of antioxidant substances (1.07%) is highest in red wines, namely in the types of wines obtained from the grape varieties of "Merlot" and "Cabernet Sauvignon."[10,23,24] The wines of these varieties are produced in large quantities in the world and in Ukraine [Table 1].

As it can be seen from Figure 3, an average dry red wine contains 86% water, 12% ethanol, and about 1% glycerin. Among the organic acids, the milk, citric, apple, acetic, and amber acids prevail in red wines, they form about 0.4%.[21] Tannins and phenolic compounds make up only 0.1%, but they themselves account for the color and taste of the wine.[23]

Consequently, the introduction of dining red wine into the parapharmaceuticals allows to create new modern products with a complex antioxidant, anti-inflammatory, and regenerating effect.

CONCLUSIONS

On the basis of the analysis, it was established that in Ukraine, there are sufficient raw materials stock of wine materials, the largest area (66.4%) is occupied by vineyards in the south of Ukraine, in particular, in Odessa, Kherson, and Mykolaiv regions.

For further study, genuine wines with a minimum content of sugar and alcohol (dining, dry) and made from one grape cultivar (ordinary) were selected. It was shown that high alcohol and sugar content in wine will affect rheological characteristics and provide a locally irritating effect for the product.

It was proved that the content of antioxidant substances (1.07%) is highest in red wines of "Merlot" and "Cabernet Sauvignon" grape varieties. The wines of these varieties are produced in large quantities in the world and in Ukraine.

For further research, red wines with the highest amount of active ingredients such as antioxidant substances (approximately 2%), organic acids (4%), and Vitamins B (up to 3%) were selected, which exhibited antioxidant, anti-inflammatory, and regenerative effects of the developed agents and promote renewal and moisturizing of the skin.

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