Substantiation of the potential of dry grape wines of Russian origin as an anti-aging factor

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Abstract. Biochemical engineering is a new field of scientific research, the roots of which go back to chemical engineering (the development of economical commercial processes for converting raw materials into useful products) and biological engineering (the creation of useful, economically feasible products). Biochemical engineering uses the results obtained by biochemists in scientific typos to commercialize them. This comment fully reveals our research, revealing the potential of Russian grape wines in anti-aging connotation. The main results are presented by resveratrol concentrations in samples of dry grape wines from various regions of viticulture and winemaking.

1 Introduction

According to the World Bank [1], life expectancy in Italy is 82 years, whereas in countries of approximately the same location and climate, for example, Bosnia and Herzegovina, as well as Croatia, where winemaking does not have the same development as in Italy, life expectancy is only 78 years. At the same time, countries with developed wine traditions, for example: France, Spain, New Zealand, Portugal and Greece have values of this indicator equal to the value for Italy - 82 and 81 years, respectively. The population of the Russian Federation, where winemaking is only in its infancy, according to the same source (data from 2020), life expectancy reaches only 71 years.

These data have been forcing scientists for more than two decades to look for explanations for the phenomenon of the wine factor that increases life expectancy. Most researchers tend to explain this phenomenon by the presence in dry red grape wines (hereinafter referred to as DRW) of a natural polyphenolic substance - resveratrol. It is also known that grape juice does not improve the absorption of this anti-aging factor compared to DRW. The concentration of resveratrol in grape wines varies significantly depending on the conditions of viticulture, as well as the peculiarities of winemaking [2]. Wines infused on the seeds and skins and grapevine stalks show a greater result.

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Scientists have become interested in the anti-aging effect of resveratrol, primarily because of its antioxidant properties. Research results also attribute heart-strengthening properties to resveratrol (prevents atherosclerosis); reducing the risk of Alzheimer's disease, preventing the formation of plaques; increasing insulin sensitivity, thereby preventing diabetes mellitus; protection from the harmful effects of obesity and aging; as well as anti-cancer properties [3]. Thus, DRW, as an object of research, where the key carrier of a biologically active substance is a natural resource, the biochemical processes of viticulture and winemaking, is relevant for the current stage of the revival of Russian winemaking. This study is also relevant from the perspective of solving the most important task of increasing the duration and quality of life of older Russians. Prevention of premature aging through moderate consumption of DRW of Russian origin requires the generation of experimental data for comparative characteristics of DRW of Russian origin. Such data has not been published before. This makes the results of the study new, having the most important social effect.

The results of the study will allow us to obtain new data on the concentration of resveratrol in DRW samples of Russian origin, which differ from foreign analogues not only by new autochthonous botanical grape varieties, but also by the peculiarities of their growth in the climatic conditions of a country with a northern climate, the peculiarities of winemaking, etc. These results will serve as a basis for the development of new scientific research in related fields of science: medicine, biotechnology, agronomy, viticulture, winemaking, lean logistics and implementation in order to convey to consumers a high level of safety of resveratrol, ensuring the typing and authenticity of DRW.

Comparative characteristics of resveratrol concentration in DRW will allow categorizing Russian wines by this factor, thereby increasing their value in the eyes of consumers seeking to increase the duration of their working capacity and intense activity.

2 Research methodology

Currently, significant factual material has been accumulated on the anti-aging potential of resveratrol, confirmed by the results of in vivo & in vitro studies [5,6]. At the same time, the problem of effective delivery of this biologically active substance (BAS) into the body of consumers is being acutely debated in the scientific community [7]. Scientists recognize the effective use of resveratrol in combination with other components of the diet of natural origin, including in the composition of dry red wines [8]. At the same time, the results of practical studies are known, confirming that the concentration of this BAS significantly depends on the variety of grape raw materials, the conditions of its cultivation, the technology of winemaking [9].

In this regard, the method of this study is a scientific review of modern experimental facts, their comparative analysis and validation.

Our bibliometric analysis is devoted to the development of the hypothesis of the positive effect of polyphenols and, in particular, resveratrol in red dry wines on the health of consumers. In this article, we have presented a comprehensive review and citation of the published results of those sources that currently make a significant contribution to the subject under discussion, the object and subject of scientific research.

3 Research results

The object of this study is the system of circulation of dry red wines (DRW) of Russian origin – from the vineyard to the glass of consumers. For the study, a selection of information sources was carried out, which directly or indirectly illuminated the state of the selected object of research.

The subject of the study is the content of resveratrol and other anti-aging factors in the composition of DRW and their changes along the entire chain of the vertical of sales - from wine materials to finished DRW in the glasses of consumers.

Wine is a complex food composition containing a wide range of polyphenols - a class of biologically active compounds. It is well known that polyphenols affect health by preventing atherosclerosis and coronary heart disease (CHD). They are considered as potential chemical compounds that contribute to cancer prevention. The concentration and specific types of polyphenols depend on the grape variety, geographical origin, cultivation methods and vinification processes [10,11]. Dry red wines usually have a significantly higher concentration of polyphenols than white wines. Among a wide class of polyphenol compounds, resveratrol and its derivatives play an important role in the prevention of these diseases. Resveratrol is a 3,5,4′-trihydroxy-trans-stilbene. This compound was first isolated by Michio Takaoka [12] from the roots of the medicinal plant Veratrum grandiflorum (white hellebore). In the practice of the previously mentioned subject of research, the terms resveratrol and trans-resveratrol are synonyms.

The hypothesis of the benefits of moderate consumption of DRW for the prevention of cancer and heart disease has attracted increasing attention in the scientific community in the last three decades. This hypothesis is based on experimental evidence of resveratrol's ability to suppress the proliferation of a wide range of tumor cells (cardioprotective effect). These studies have made resveratrol a promising drug in medicine [13].

Studies have also shown a confirmed link between the consumption of red wine and the previously mentioned Mediterranean paradox of increasing life expectancy in this region of Europe. At the same time, the traditional diet of the inhabitants of the Mediterranean is saturated with fats, and the concentration of cholesterol in the blood is proven to be higher than citizens of other regions of Europe. With such dietary indicators, mortality from cardiovascular diseases in the Mediterranean region was relatively low. As a possible explanation, the hypothesis of a positive effect on the life expectancy of consumption of dry red wine during meals was proposed. It should be noted that this hypothesis currently remains a scientific discussion, calling on modern scientists of various branches of science to further research the pharmacological use of resveratrol and its dry red wines.

Researchers of the last two decades [10] have identified trans-resveratrol as the most important factor in inhibiting platelet aggregation, thereby explaining the protective role of red wine against atherosclerosis and coronary heart disease. The same antiplatelet activity of resveratrol was found in red wine [10]. Research results show that the antiplatelet effect of resveratrol is associated with its concentration in red wine.

During the same period, researchers confirmed that resveratrol exhibits preventive activity against cancer, acting as an antioxidant and antimutagen [10]. The data obtained indicate that resveratrol can be considered as a potential factor for cancer prevention in humans, in particular, the estrogenic effect of resveratrol as a phytoestrogen against human breast cancer cells has been confirmed.

Resveratrol deserves attention on the results of its clinical evaluation as a potential preventive agent in colorectal cancer [14]. Studies conducted on healthy volunteers have shown a positive effect of pharmacological doses of resveratrol on enzymes that metabolize drugs. It has been suggested that resveratrol can modulate enzymatic systems and thereby inhibit carcinogenesis in humans.

It has been experimentally established in vivo in clinical conditions that resveratrol can penetrate the blood-brain barrier and have a protective effect against ischemic brain damage [15]. These data on resveratrol in vivo have been comprehensively and critically analyzed by other authors, on the basis of which it is concluded that the potential of resveratrol can also be considered as a therapeutic agent for humans [16].

A number of publications indicate that the concentrations of resveratrol and its glycoside have significant values not only in grapes, but also in other foods of plant origin, for example, peanuts and Itadori tea. This type of tea is traditionally used in Japan and China as a preventive natural remedy for heart disease and stroke [17]. This publication expands the possibilities of consuming resveratrol with food, because for people who do not consume dry red wines, Itadori tea can be a suitable substitute for red wines.

4 Result discussion

The results of the planned study will provide the generation of new scientific data on the concentration of resveratrol in DRW samples of Russian origin, which differ from foreign analogues not only by new autochthonous botanical grape varieties, but also by the peculiarities of their growth in the climatic conditions of a country with a northern climate, the peculiarities of winemaking, etc. Such results will serve as a basis for the development of new scientific research in related fields of science: medicine, biotechnology, agronomy, viticulture, winemaking, etc. in order to apply the anti-aging effect of DRW of Russian origin justified in this project. Comparative characteristics of resveratrol concentration in DRW will allow categorizing Russian wines by this factor, thereby increasing their value in the eyes of consumers seeking to increase the duration of their working capacity and intense activity.

The scientific novelty of the study lies in the fact that there is no reliable information about the potential of DRW of Russian origin in the available sources of information. The use of the required information obtained by other authors on the example of a foreign-made DRW has shown expediency for a number of objective reasons:

The concentration of resveratrol in grapes depends to a large extent not only on its botanical variety, but also on the specific conditions of its cultivation, which in the world practice of viticulture is called an appellation (fr. Appellation), which includes a set of requirements of a geographically defined limited territory with its established ecosystem, methods of grape cultivation, including the type of soil on which grapes grow, the age of the vine, the number of vines per unit of soil area, the amount of harvest from the vineyard, etc.;

Features of vinification: in the production of DRW, only the type of wine and its production technology established for this appellation can be used. Wines that are infused on the seeds and skins and grapevine stalks show a greater result. Traditional methods of winemaking make it possible to achieve a higher concentration of resveratrol and other BAS in finished wines compared to carbon maceration. To fully extract various plant antioxidants from grape skins and seeds, the wine is infused until the fermentation process is completed. Each winery chooses its own technological modes, which lead to different concentrations of resveratrol and other BAS in the DRW;

Logistics features: each winemaker chooses a suitable logistics scheme independently. Thus, in world-renowned appellations that value the business reputation acquired over the centuries, reliable methods and routes for moving raw materials, semi-finished products and finished wines along the entire chain from the field to the glass of consumers are used to maintain the constancy of the taste and aroma parameters of the DRW, sometimes they refuse obvious economic benefits in favor of historical traditions. On the contrary, new DRW winemakers that do not have such traditions form logistics chains based primarily on economic expediency, while losing the quality of their DRW. Russian winemakers, of course, differ in this parameter from their foreign colleagues from world-class appellations. For this reason, the concentration of resveratrol and other BAS in their products will differ significantly from foreign analogues.

The consumption of finished DRW by Russian and foreign consumers also has significant differences both cultural and cost. In this regard, the delivery of resveratrol and other BAS,

which are part of the DRW, into the body of consumers will vary significantly, significantly changing the anti-aging potential of these wines.

5 Conclusion

The results presented in the article will open interdisciplinary vectors of future research, including in the fields of science: biotechnology, viticulture and winemaking, food science (foodomics, etc.), etc. These studies will make it possible to extend the duration of the physically active life of Russians, which is a program task set for scientists of our country. At the same time, the cited publications overlook convincing evidence of human absorption of resveratrol in biologically significant amounts. The authors of these studies question, but do not exclude, the beneficial properties of moderate consumption of red wine.

Justification of moderate consumption of wines with a high concentration of resveratrol in the composition of DRW and rational adequate nutrition will significantly advance in solving this important task. In modern science, there is no information about the categorization of DRW of Russian origin based on the concentration of resveratrol in them, therefore, the generation of data required to solve this problem is relevant.

The authors of this article emphasize that they are not experts in the field of medicine, but are active advocates of healthy nutrition and comprehensive prevention of diseases of the 20th century, such as cardiovascular diseases, cancer, etc. For an in-depth interpretation of the results of this bibliometric study, additional expert assessments are needed. Readers with access to international scientometric databases can review the publications cited in this review for further analysis in accordance with their own scientific interests and needs.

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