Bioengineering concept of winemaking development to reduce the risks of age-related diseases

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Abstract. Scientists explain the anti-aging effect of red dry wines consumption primarily because of the presence of the biopolyphenolic compound resveratrol, which has pronounced antioxidant properties. There is experimental evidence that unfermented grape juice, from which red dry wines are produced, has a lower efficiency of absorption of the biopolyphenolic compound resveratrol in the body of consumers, in contrast to ready-made red dry wines [8]. The concentration of resveratrol in red dry wines (according to the same source) varies significantly depending on the grape variety, as well as the characteristics of its vinification. The greater effect is showed by the wines infused on the mesga and crests of the grape brush, because it is in the grape's skin berry that the concentration of resveratrol and other biopolyphenols is maximum. The results of previously cited studies describe the anti-aging effects of resveratrol because of its proven properties beneficial to the aging body of consumers, such as strengthening the heart (prevents atherosclerosis); reducing the risk of Alzheimer's disease, preventing diabetes, obesity and aging, anti-cancer properties [3; 10]. Alcohol contradicts the positive effect of resveratrol and other polyphenols in red dry wines. Experimental data on this issue in sources were not found because of the lack of experimental studies. However, to eliminate this contradiction, it is advisable to consider in the Project, besides red dry wines themselves, also low-alcohol drinks based on them (with juices, extracts, etc., reducing alcohol concentration), as well as their industrial partial or even complete de-alcoholisation [7]. There is also a debate in scientific circles about the fact that the concentration of resveratrol that is proven effective in eliminating the risk of diseases associated with age-related changes in the body of consumers is not typical of its concentration in red dry wines. Experimental data show that the concentration of resveratrol that is proven effective in eliminating the risk of diseases associated with age-related changes in the body of consumers is not typical of its concentration in red dry wines. Experimental data show that the concentration of resveratrol, even in selected types of red dry wines, clearly does not manifest this effect. To eliminate this factor, it is advisable to provide for the addition to the above drinks based on red dry wines of materials of natural origin with a high concentration of resveratrol and other biopolyphenolic compounds effective in terms of prevention of age-related diseases (e.g. dihydroquercitin, etc.). Research in this direction is being

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conducted by Russian scientists and their results are expedient to be used to achieve the goal of this project [4]. Red dry wines of Russian origin may hypothetically contain a significant concentration of resveratrol and other bioflavonoids, because of the peculiarities of the climatic zone of the Russian Federation and the traditional winemaking system, which provides for long aging of the wine material on the mash and crests of the grape cluster. No information on the comparative characterisation of red dry wines of Russian origin has been previously published. The development of the concept of biological engineering will make it possible to substantiate the categorisation of red dry wines of Russian origin according to the concentration of biopolyphenolic substances of anti-aging effect in them, and to substantiate the biotechnologies of their winemaking and viticulture as they ensure the achievement of the specified social effect.

1 Introduction

The great thinker of the Middle East Abu-ibn-Sina (Avicenna, 11th century A.D.), known as a scientist and healer, figuratively expressed about wine consumption: "Wine can be both medicine and poison: a little wine is a medicine, a lot of wine is a deadly poison. Drink wine in moderation - and the kingdom of life will last". Modern scientists and physicians recognise the scientific heritage of Avicenna. For more than a millennium scientists from all countries of the world have been searching for explanations of the phenomenon of red dry wine consumption to increase the life expectancy of consumers.

Most researchers explain this phenomenon by the presence in red dry wines of a natural polyphenolic substance - resveratrol and other biologically active substances of polyphenolic nature, acting as an "anti-aging" factor in moderate consumption of these drinks under the heritage of Avicenna and modern medical recommendations. Grape juice has not been found to improve the absorption of these polyphenolic compounds compared to red dry wines [9].

Scientists in various countries has studied the resveratrol content in a glass of red dry wine within the old wine world's range [8]. Researchers have found that the concentration of resveratrol in red dry wines varies significantly depending on the grape variety and the characteristics of its vinification. They found the best results in red dry wines infused on the mesga (the skin and seeds of the grape berry that has quit its juice) and also on the crests of the grape brush.

There is a considerable number of publications on whether the known effects of controlling and treating diseases characteristic of people aged 65+ and, as a result, the positive health effects of moderate consumption of red dry wine (only a glass of red dry wine every day) are because of the presence of resveratrol, dihydroquercitin and other bioflavonoids in them? The alcohol content of red dry wines is also being studied, which itself has independent effects in reducing the risk of the same diseases characteristic of older consumers: atherosclerosis and coronary heart disease [12].

2 Material and methods

Original materials and review articles on the discussed subject, placed in the open database, published for the last 5 years were used in the article.
3 Results and discussion

Scientists are keenly interested in the anti-aging effect of resveratrol, dihydroquercitin and other biopolyphenols included in red dry wines through the manifestation of their pronounced antioxidant properties. Researchers assert that this positive effect of red dry wine consumption is provided, first, by antioxidant properties of these biopolyphenols [5; 6].

Many studies by Russian and foreign authors are devoted to the identification of the mechanism of the positive effect of resveratrol, dihydroquercitin and other biopolyphenols included in red dry wines on the management and therapy of diseases typical for elderly people. The above effect, according to the researchers, is achieved, among others, because of the anti-inflammatory effects of these biopolyphenols. Other reasons for this effect are the strengthening of the heart of consumers (biopolyphenols present in red dry wines prevent atherosclerosis). There is scientific evidence that the biopolyphenols in red dry wines also can inhibit platelet aggregation in the blood of consumers. There are also scientific arguments about the participation of the said biopolyphenols of red dry wines in preventing the formation of plaques in the blood vessels of consumers, in reducing the risk of Alzheimer's disease [3].

Research results are provided that these biopolyphenols increase the sensitivity of red dry wine consumers to insulin preventing the disease of diabetes mellitus and obesity. The anti-cancer properties identified in resveratrol of red dry wines also impact longevity [2; 13].

With all the attention related to the "anti-aging" effect of resveratrol as a pharmaceutical agent, a serious problem has been identified - its poor bioavailability. We mention it is well known that the absorption of biopolyphenols contained in grapes is better than pharmacy synthesised drugs of similar action.

In terms of the use of red dry wines as a component of the dietary intake of consumers aged 65+ years, data are known that show that resveratrol and other biopolyphenols present in red dry wines, taken in combination with the standard diet of this group of consumers, increases their concentration in the blood. Resveratrol together with other biopolyphenols in combination with other food components that contain the same enzymes, biopolyphenols have the theoretical advantage of avoiding metabolism while passing through the liver after absorption in the intestine [3]. However, eating high-fat foods critically reduces the absorption of these valuable biopolyphenolics and diminishes the positive disease risk reduction effects specific to the age group of consumers. This finding should be considered when planning the dietary intake of elderly consumers of red dry wines.

The above data testify to the relevance of the planned project study for the current stage of revival of Russian viticulture and winemaking to solve the most important problem of improving the life expectancy and quality of life of elderly Russians and preventing premature ageing through moderate consumption of red dry wines of Russian origin. Because of the national peculiarities of viticulture and winemaking, red dry wines of Russian origin can hypothetically contain a significantly higher concentration of biopolyphenols, unlike their analogues produced in the old wine world countries. The peculiarities of viticulture cause these differences in the climatic zone of the Russian Federation (northern country) and the traditional Russian winemaking system, which provides for a long aging of wine material on the pulp and crests of the grape cluster. It is reasonable to scientifically argue these advantages through the generation of experimental data, outlined in the claimed project study and subsequent larger-scale studies.

The sphere of viticulture, winemaking, and commodity circulation of red dry wines of Russian origin and non-alcoholic beverages on their basis (the field of research) is the most important scientific task that allows to create organisational conceptual conditions for the maximum possible saturation of finished red dry wines and non-alcoholic beverages on their basis with biopolyphenols (the subject of research). The claimed design study and the
subsequent ones are undoubtedly relevant experimental research in the interdisciplinary field of agricultural, technical, medical, and economic sciences.

The scientific novelty of this study lies because reliable information is generated about the potential of red dry wines of Russian origin and soft drinks based on them. Such information is not available in the sources [14].

The authors of this article have extensive practical experience of experimental research on categorisation of wines based on the criterion of their authenticity in terms of physicochemical parameters. It is logical to get such experience on the functional criterion of delivery to the organism of the target consumer group of biopolyphenolic substances with high potential for prevention and therapy of diseases characteristic of aged people.

Using similar information got by foreign authors about red dry wines from foreign production [11] is not appropriate for several objective reasons.

The concentration of resveratrol and other biopolyphenols in grapes depends to a large extent not only on their botanical variety but also on the specific conditions of their cultivation, which in the world practice of viticulture is called appellation, which includes a set of requirements of a geographically defined limited area with its established ecosystem, methods of cultivation of grapes, including the type of soil on which grapes grow, the age of the vines, the number of vines per unit area of soil, the amount of yield from the grapes.

Specifics of grape vinification: in the production of red dry wines, only the type of wine and its production technology established for this appellation can be used. To realise the aim of this project, we should note that the highest biopolyphenol concentrations are found in red dry wines that are infused on the mesga and crests of the grape brush. This method of vinification of grapes is characteristic of Russian winemaking, unlike foreign ones;

Logistics: each winemaker chooses the logistics scheme on his own. Thus, world-renowned appellations, which value the business reputation they have gained over the centuries, use reliable methods and routes for the movement of raw materials, semi-finished products, and finished wines along the entire chain from the field to the consumer's glass to maintain the consistency of flavour and aroma parameters of red dry wines. They leave, sometimes, obvious economic benefits in favour of historical traditions. Russian winemakers of red dry wines, who do not have such traditions, form logistic chains based primarily on economic expediency, thus losing the quality of their red dry wines. The biochemical engineering concept formed in the Project creates a vector to eliminate this shortcoming.

In the current period, the governments of the traditional wine old world countries have imposed sanctions barriers, making their products inaccessible to Russian consumers.

4 Conclusion

Based on the data it is expedient to form the generation of experimental data about research for substantiation of anti-aging potential of red dry wines of Russian origin and to form a bioengineering concept on its basis in order to inform all participants of the sphere of production and distribution of red dry wines of Russian origin, as well as soft drinks on their basis about the potential of their products to reduce the risk of age-related diseases and thus to increase the level of longevity of life.

References


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