

## WINE AND HEALTHS

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**Abstract.** The article discusses the impact of wine components on health. Wine has been an integral part of our culture for 8000 years. Since ancient times, wine has been known to have excellent healing properties. Free radicals are constantly formed in the processes occurring in a living organism and they often have a harmful effect on the body. Free radicals are one of the main causes of aging, as well as dangerous cardiovascular and oncological diseases. Wine contains biologically active phenolic compounds with antioxidant properties that are important for human health. Red wines, made by the traditional Georgian method, are especially rich in them. Determining the antioxidant activity of wine is an important task. Attention is focused on the importance of resveratrol as an enhancer of vital biological processes, such as: inhibition of low-density lipoprotein oxidation, which has a significant effect on atherosclerosis; protection of DNA from oxidative damage, protection of the vascular system by strengthening capillaries, etc. It is important to seek scientific foundations for improving the quality of wine and obtaining competitive finished products on the world market.

**Keywords:** *Wine components, antioxidant activity, resveratrol.*

**Introduction.** Wine is one of the most widely consumed products in the world, which, as scientists have proven, contains biologically active phenolic compounds that possess antioxidant properties important for human health. There are 5000 varieties of grapes in the world. Each variety has its own specific properties that give wine a special taste. Grape juice is turned into wine as a result of alcohol fermentation under the influence of yeast and microscopic fungi. Alcohol and carbon dioxide are obtained as a result of alcoholic fermentation of natural sugars, monosaccharides — glucose and fructose. Secondary fermentation-lactic acid fermentation-occurs later and as a result the acidity of the wine decreases. Fermentation is a natural process during which complex chemical reactions occur. Fermentation begins when the sugar in the grapes reacts with yeast and with microscopic fungi. At First, ethanol is released - wine alcohol and carbon dioxide, and then other substances are formed: glycerin, essential oils, various aromatic substances. Acids contained in wine are important components of the finished wine product. They are contained both in grapes and in wine. Both grapes and wine contain these acids, which have direct influence on the color, taste, growth and viability of yeast during fermentation, and they protect wine from bacteria. Most wines have a pH of 2.9 to 3.9.

#### **History of Wine and Its Health Benefits**

Wine has been an integral part of our culture for 8000 years. It has been known since ancient times that wine has not only nutritional and taste characteristics, but also has the best healing properties. Wine is rich in biologically active natural substances - phenolic compounds- that have a high antioxidant effect.

According to archeological data, in Georgia the history of winemaking began 8000 years ago. In our country, wine is made mainly in two ways, namely:

1. Traditional (Kakhetian method), in which crushed grapes are placed in a jar and alcoholic fermentation takes place along with the hard parts of the grapes.
2. European method – when alcoholic fermentation occurs without strong parts of grapes.

Free radicals are constantly formed in the processes occurring in a living organism and often have a harmful effect on the body. Free radical interactions are one of the main causes of aging, as well as dangerous cardiovascular and oncological diseases. A living organism has powerful ways of fighting against free radicals: due to the processes occurring in the body, the concentration of free radicals can increase, which leads to cell damage and even death of the organism. Free radicals enter the body in different ways: smoke, polluted environment, fast food. The body has ways to fight free radicals - these are enzyme systems and natural antioxidants. As a result of pathogenic processes in the body, the concentration of free radicals

can sharply increase, which damage proteins, lipids, nucleic acids. There is an assumption that they cause diseases such as allergies of various origins, Alzheimer's disease, atherosclerosis, arthritis, cancer, cirrhosis of the liver and others. It has been established that up to 60 diseases are caused by excess free radicals, i.e. free radicals are the main cause of many diseases.

What is the so-called «French paradox»? Studies have shown that the French are less prone to cardiovascular diseases compared to other nations. This effect is explained by the fact that the French consume much more red wine. The polyphenolic compound-resveratrol- found in red wine, is characterized by strong antioxidant capacity. «French paradox» was associated with resveratrol. Wine also contains many other compounds of an antioxidant nature, which together with resveratrol, determine the healing effect of wine. Resveratrol itself is 10-20 times stronger antioxidant than the natural antioxidants-vitamins C and E.

Resveratrol is especially effective in the treatment of cardiovascular diseases. Free radicals damage the structure of proteins that make up the walls of blood vessels, causing the vessel to become rough, lose elasticity, form so-called "bad" cholesterol, atherosclerotic plaques. Consequently, the blood vessel can no longer effectively participate in blood flow. From a biochemical point of view, this process is described as follows - low-density lipoproteins (LDL), oxidized by the action of free radicals, stick to the cells of the arterial walls, create a growing structure, which ultimately represents the above-mentioned plaques.

### **The Georgian Winemaking Tradition**

It is known that wines produced in qvevri (earthenware) using the traditional Georgian method are characterized by higher extraction than wines produced using European technology. The high extractability of the wine leads to the high content of phenolic compounds in it, which take an active part in the formation of the type of wine, at all stages of its production and storage and have a direct influence on taste, bouquet, color, tartness, aging ability, etc. d.

Flavonoids and stilbenes are concentrated in the skin and pits of grapes and are extracted in the process of wine fermentation. So, the Kakhetian (traditional Georgian) way of making wine is noteworthy, in which the wine (both white and red) is fermented without removing the skin and seeds (when there are a large number of hard parts of the grape), which enhances the process of maceration. Maceration time should also be taken into account.

It has been established that Georgian wines in many cases are characterized by a significantly higher total phenolic composition than foreign ones (European, Australian, South African, etc.). It is worth noting that this is true for wine produced at the factory and bottled, and it is expected by itself in wine made in the traditional Kakhetian way. Polyphenolic compounds include antioxidants - flavonoids and stilbenes, their high content in Georgian wines does not cause doubts and is confirmed by the results of conducted analyses.

The unique healing effect of Georgian wine can be confirmed by determining the antioxidant activity of the wine as a whole, as well as the main antioxidant components contained in it (first of all, resveratrol). The specified work has already started in Georgia. This question became the basis of a systematic study of Georgian table wines of various origins and table wines, both factory and traditional Georgian wines produced from different grape varieties, with the aim of determining their antioxidant potential. The concentration of resveratrol found in white wine prepared by the traditional Kakhuri method puts it on the same level as red wine in terms of medicinal properties. In addition to the unique taste and aromatic properties of Georgian wine, which by themselves are an indicator of quality, the strong healing properties of wine are based on the high content and potential of antioxidants. In connection with this, the presentation of Georgian wine will greatly contribute to its popularization and establishment of its place on the world market, and the production of quality wine, placed in Kvevri (earthenware) according to the traditional Kakhetian method, is connected with the development of wine tourism in Georgia.

In addition to food and taste value, wine also has the best healing properties due to the presence of flavonoids (myricetin, quercetin, kaempferol, isorhamnetin, catechin, epicatechin, anthocyanins) and stilbene - cis- and trans-resveratrol in glycosylated and aglycone forms. The latter are characterized by strong antioxidant activity. Wine contains dozens of polyphenol compounds, especially resveratrol.

Throughout the 8000-year history of winemaking in Georgia, the people's accumulated knowledge of wine includes the widespread use of its healing properties. It is known from our ancestors that you need to drink a glass of Saperavi or other red wine for dinner to maintain health. At that time, nothing was known about resveratrol.

### **Phenolic Compounds in Wine**

It is known that phenolic compounds contained in wine are able to stop peroxidation processes and thereby prevent the destructive effects of free radicals on living organisms, premature aging of cells, since they contain antioxidants - flavonoids and stilbenes - which are especially effective in the treatment of cardiovascular diseases. Determining the antioxidant activity of wine is quite an important task. It should be noted that flavonoids and stilbenes are present in the seeds and skins of grapes and are extracted during fermentation of wine. It is worth noting that the method of winemaking in Kakheti is distinguished by the fermentation process. It is completed on a large amount of chacha (peel and seeds), during which the maceration process is enhanced and, thus, the concentration of polyphenols in the wine increases.

It is well-known that Georgian wine contains more phenolic compounds than European and other wines. In addition, antioxidants such as flavonoids and stilbenes are polyphenolic compounds, the content of which is high in Georgian wines. Analytical studies conducted in Georgia confirm this.

The search for new effective natural antioxidants for the treatment of various diseases is one of the important current tasks of modern medicine.

The spectrum of phenolic compounds of grapes is rich and diverse. It is represented by flavonoid compounds, such as proanthocyanidins (oligomeric and polymeric), flavanols, flavones, and anthocyanins and non-flavonoid (stilbenoids, phenolic acids, phenolaldehydes) compounds. Phenolic compounds actively participate in oxidation-reduction transformations and significantly determine the quality of wine. At the same time, phenolic compounds are characterized by biological activity expressed in different directions, which, in turn, determine the medical and nutritional value of wine and its functional purpose. Wines produced by the "durdo" alcoholic fermentation method are rich in phenolic compounds. Kakhetian and Imeretian red wines belong to them. In the process of alcoholic fermentation, phenolic compounds from the cool parts of the grapes are transformed into the fermentation zone and then are localized in the wine material. The composition and activity of phenolic compounds in wine is determined by the preparation method, as well as the aging period and storage conditions of the finished product. It is known from literary sources that red wine contains more than 400 medicinal substances. Experiments conducted by scientists have established the physiological role of the components of wine's phenolic compounds in various biochemical transformations occurring in the living organisms. The biological activity of red wine is mainly due to the phenolic compounds in its composition, which are antioxidants.

Phenolic compounds in red wine have the ability to inhibit the oxidation of low-density lipoproteins in the human body. In the body, under the action of free radicals, there is constant peroxidation of lipids with a certain intensity, which causes the structural breakdown of molecules. The intensity of formation of free radicals is regulated by antioxidant mechanisms. Violation of this process leads to the accumulation of oxidative damage and, therefore, oxidative stress, which is associated with the development of various pathologies, including age-related diseases. That's what led to the wide interest around this topic. In the human body Flavonoids show antioxidant activity, regulate lipid exchange, have anti-inflammatory, anti-allergic effects, etc. Wines with high antioxidant activity contain strong antioxidants such as: resveratrol, quercetin, catechin and caffeic acid — strong antioxidants. According to scientists, the antioxidant and biological activity of phenolic compounds depends on the characteristics of grape varieties, their location, winemaking technology and other factors. Currently, many

research centers around the world, including in Georgia, are studying the beneficial properties of wine. At the Institute of Materials Science of the Tbilisi State University and at the Department of Physical and Analytical Chemistry, research is being conducted on determination of phenolic antioxidants in red wines. It is known that in the process of wine storage, oxidative condensation and polymerization of phenolic compounds occurs, which leads to a change in the biochemical composition of wine. Regarding this, it is interesting to study the content of individual phenolic compounds after 3–5 years of wine storage.

#### **How does the antioxidant resveratrol work?**

It inhibits the oxidation process of low-density lipoproteins and prevents the formation of atherosclerotic plaques. Therefore, the increase in the concentration of resveratrol in the blood prevents peroxide oxidation of lipids and low-density lipoproteins. There is data that resveratrol has a certain ability to act on the initiation, growth and developmental stages of various tumors. In case of initiation of malignant process, resveratrol acts as an inhibitor of free radicals and as an antimutagen. It has been established that resveratrol is an inhibitor of tumor cells. According to available data, resveratrol slows tumor growth by inhibiting cyclooxygenase-1. The latter is an enzyme that turns arachidonic acid into a compound that stimulates the growth of tumor cells.

One more mechanism of action of resveratrol against cancer is established - the enzyme found in tumor cells (CYP1B1) is responsible for the conversion of resveratrol into piceatannol, which is a highly toxic compound and destroys tumor cells. Since the conversion of resveratrol into piceatannol occurs only in tumor cells, the produced piceatannol is localized, removes only the tumor cell and does not damage healthy tissues. Thus, the quantitative content of resveratrol and other antioxidants in wine has great importance. Due to alcohol, the norm of daily wine consumption is determined, which is about 300 ml for men and 150 ml for women.

In recent years, winemakers consider the content of resveratrol to be an indicator of the quality of red wine. Its content in ordinary wine is not less than 3-4 mg / l, wine with 5-7 mg / l is considered good, and with 7-10 mg / l - very good, and if its content is more than 10 mg / l, it is an outstanding wine. The content of this substance in newly-made and old wines is relatively small.

**Conclusion.** The health effects of polyphenols are well known due to their antioxidant activity, which contribute to various biological processes, such as

- inhibition of low-density lipoprotein (LDL) oxidation, which has a significant impact on atherosclerosis;
- protection of DNA from oxidative damage, which has a significant impact on the development of some age-related cancers;

- protection of the vascular system by strengthening the capillaries that transport oxygen and other essential nutrients to the cells;
- antithrombotic and anti-inflammatory effects;
- antimicrobial activity against viruses, bacteria and hepatotoxins.

Therefore, it is important to find a scientific basis for improving the quality of wine, improving the quality of red wine and obtaining competitive finished products on the world market. The quality indicators of wine are determined by its chemical composition, which is presented by constituent components of grapes and their transformation products.

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