Study on wine grape varieties worldwide and in Romania: a Review

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Abstract Despite the favorable conditions for the cultivation of vines and retraining measures, Romania, the sixth largest wine producer in the European Union is sending abroad only 3% of the domestic production, far behind countries such as France or Italy. This study refers to some very important aspects for growing wine grape varieties from economic and social, food and medical perspectives as well. This covers: the genesis of wine, wine importance as food production and consumption of wine worldwide and in Romania, the content of anthocyanins in red wine grape varieties.

Wine, throughout its evolution, having been compared to a being who is born, lives and dies, has had a major influence in areas with direct or indirect contribution: economic, social, religious, cultural and commercial [18].

Key words wine grape varieties, wine genesis, consumption of wine, alcohol, phenolic compounds

Wine is certainly much older than the historical record where it is certified 2000 years ago. There are many myths told about the first cultivation of the vine and wine. The biblical book of Genesis mentions for the first time wine from the Great Flood, when Noah shows himself drunk to his sons. The Greek mythology mentions about Dionysus' childhood and the fact that he discovered viticulture on the alleged mountain Nysa, spreading this knowledge to the peoples from central Anatolia. For this reason, he was appointed the God of wine.

Since the fourth century, due to its importance in the socio-economic life, viticulture becomes increasingly recorded in historical documents of the time. Hungarian chronicler Anton Verancsis (1504-1573), says in his description of Transylvania, Moldavia and the Romanian Land "hills covered with vineyards and wines arise everywhere, whether you want them strong or weak, rough or sweet, white or red, they are so good in taste and so special in variety that you do not want any Falerna wines from Campania and even when comparing them to these, you love them more."[36]

A few years later, in 1646, the catholic missionary Marcus Bandinus, mentions in his notes from Codex Bandinus that “all the southern part of Moldavia produces so much wine that during harvesting they sell a bucket (10 litres) for four bani and during winter they sell it with six or seven”.[11]

The genesis of wine

Throughout the study on the genesis of wines we pursued information on the invention, tradition, consumption and the recognition of wine on behalf of different populations.

Wine has played an important role in the ceremonial tradition of ancient Egypt. A flourishing industry developed in the Nile Delta after wineries cultivation was “imported” from Levan to Egypt (about 3000 BC), during the Third Dynasty. Preparation of wine scenes on the walls of tombs and accompanying writings prove that wine was produced in the vineyards of the Nile Delta. In ancient Egypt red wine was produced mainly, the colour resemblance to that of blood was surrounded by superstition. We know today that Shedeh, the most precious drink of ancient Egypt, was prepared from red wine, not from pomegranate juice as originally thought. [20]

Over time, various dynasties continued the tradition of wine growing, especially in monastery areas. In recent decades, statistics show that in Spain over 600 grape varieties are grown, but of these 20 represent about 80%. The most cultivated variety is white Airen variety, very strong and durable, for years being used to obtain Spanish brandy, wine results from this variety having a high alcohol concentration and rapid oxidation. [35]

Romans also actively contribute to improving techniques of wine making: they manage to age wine for twenty years and, in addition, to keep it in amphoras of twenty-six litres, with the date of bottling and origin on them. Horace speaks thus about a sixty year old wine. As for Pliny the Elder, he claims to have had the opportunity to drink two centuries old wine.

Wine has a long history in Spain as well. The Spanish have cultivated vines since 4000 BC, but it really became an occupation when the Spanish territories were conquered by the Romans, who wanted to consume quality wine. Most sources suggest that the first vineyards were planted on the south-west coast of
Andalusia, especially due to the presence of Phoenicians about 3,000 years ago.

The Germans have a long tradition in the cultivation of vines as well, but also here quality wine was brought in by the Romans in their campaigns. Marcus Aurelius involved even the soldiers in plantations, the most famous wine region is the Rhine. Many of the viticulture practices were brought from different parts of the Roman Empire, the trellis leading system survived in some regions of Germany until the XVIII century. [35]

Conquering new territories, the Romans brought the vine with them. In France they began with the Rhône valley and then across the whole country. The wines made from those times were acknowledged as being of high quality. Throughout history, the wine industry in France has been influenced and shaped by commercial interests and profits of English and German traders. Before the French Revolution, French Catholic Church owned the largest area under vines, including the well known Champagne and Burgundy regions.

Under these external and internal influences, the French wine industry was the main pillar for the planetary industry of this product, with many wines as reference for their characteristics. Late twentieth and early century XXI brought major changes caused by changes in the global market and competition with other European countries such as Italy and Spain and new competitors such as California, Australia and South America. [26]

The importance of wine as food

The Grape therapy, also called Ampelotherapy (Ampelos = vine) or Uvala therapy (uva = grape) has been practised for millennia. Scientific research in recent years restores the faith in grape therapy. In recent years there is an increase in the consumption of fresh grapes, due to the general trend to move towards safe food, where plant resources play a crucial role. [9]

The idea of using wine as a medicine dates back to ancient Egypt. Red wine was widely used in religious rituals and priests recommended it for physical and mental illnesses.

Despite its beneficial effects, excessive consumption of wine leads to many shortcomings. At the end of the ninth century, people began to have a different view on alcohol, many who constantly drank wine becoming alcoholics. Medical studies of those times considered alcoholism a disease and focused primarily on the effect of alcohol on the body due to long term consumption.

Quality wine contains over 300 different chemicals, many of which are similar to those found in fruits, vegetables, spices or herbs. [37] Wine contains a number of easily assimilated substances such as sugar, alcohol, glycerol, organic acids, tannins, esters, aldehydes, proteins, amino acids, vitamins, mineral salts etc. A litre of wine equals, regarding the energy-
Despite the beneficial effects of resveratrol, the bioavailability is reduced due to rapid metabolism in mammals [30]. In 2008, a group of British researchers found in red wine a high content of heavy metals analysed in comparison with other beverages. Although metal ions, such as chromium, copper, iron, manganese, nickel, vanadium, and zinc were found in most of the fruit or vegetable beverage, the content of the wine samples tested was much greater, in particular vanadium [22]. Researchers concluded that moderate wine consumption of 250 ml/day did not result in heavy metal toxicity [29].

Production and consumption of wine worldwide and in Romania

Romania is one of the major wine-growing countries of the world, currently holding an area of 243,000 ha vineyard (242,000 ha vineyards bearing fruit, plus 1,000 ha of young vines). Wine grape plantations occupy 82% of the total area under vines and wine production are at the level of 5-6 millions hl annually.

In recent years, the vines area of countries belonging to the European Union has declined as a result of the implementation of the new common market organization, deforestation of old plantations and the influence of climate change. Since 2009 subsidies were lowered to reduce production surplus and uncompetitive wine production, producers are compensated for sustainable alternatives.
According to statistics in FAOSTAT in 2012, Romania ranks 11th place in the top vine cultivators countries worldwide, categorized by acreage and ranks 19th among world producers of grapes. Our country is placed in the top ten wine consumers worldwide with 22-24 litres per capita, representing only half of the consumption by developed countries, which amounts to 50 litres / capita. 60-70% of consumers prefer white wines. France remains the largest wine consumer, although per capita consumption has fallen steadily since 1960, stabilized around 46.4 litres per year / capita. In 2012, the French bought 60% of the wine consumed in hypermarkets. Red wine was purchased in a proportion of 50%, followed by rose wine and white wine barely falling on the last place.

Wine consumption in Italy has been decreasing for decades. The cause of this decline is the changing lifestyles and anti-alcohol campaigns. In 2013, wine consumption was below 40 lit litres / consumer considerably less than in 2007 when it was 45 litres or 110 litres in the 1970s. Despite austerity measures, Italian wine consumers are seeking quality wines but at an affordable price (Bettini O., 2014). Average consumption of wine / capita in Croatia is on average 28 litres. Wine market in Croatia is developing and is expected to rise with living standards.

In Hungary, after decades of gradual decline in wine consumption the trend has stabilized due to the demand for quality and imported wines and price increase at beers. 20% of the total consumption of wine is produced in private households, a percentage that is expected to increase due to economic problems. Wine consumption / capita in Bulgaria decreased from 6.7 litres in 2009 to 5.5 litres in 2012. Red wine has recorded the worst decline while consumption of white wine has increased due to consumer loyalty and hot summers in 2012 and 2013 (Bettini O., 2014). Several valuable native varieties belong to the Romanian vines, maintained in the culture after the invasion of phylloxera as well, and a number of foreign varieties with acknowledged oenological qualities [25]. The assortment of white wines is dominated by three varieties, two domestic and one of foreign origin: Feteasca Alba, Feteasca Regala and Italian Riesling. Among red wine varieties, the largest expansion belongs to Cabernet Sauvignon and Merlot. Due to climatic conditions, soil and assortment, differing even in small areas, in Romania there is a wide range of wines and wine-based drinks and wine.

Contrary to the overall trend in the wine market, which implies a much higher consumption of red wine at the expense of white wine, in Romania white wines are grown mainly. This is reflected in the vineyards in our country and includes mostly varieties of vines for white wines.

The total area of vineyards - in bearing and young – (leaving out wine-growing areas which were not used last year and the areas planted with vines in private households) counted in 2009 on 180 262 hectares, the number of farms that have used areas with vines rose up to 894.000. The area cultivated with vineyards since 2000 has decreased year by year reaching a minimum of 170.975 ha in 2007 after which a slight recovery in the years that followed.

**Anthocyanin content of the red wine grape varieties**

Grapes contain a large number of classes of secondary metabolites, polyphenol composition is very diverse as in quantity and quality. The main polyphenols are anthocyanins, flavone derivatives and stilbenes, three
classes of compounds with special characteristics which play an important role in plant metabolism [14]. The highest concentrations of phenolic compounds are found in the bark, seeds and bunches of grapes. Phenols composition is largely influenced by grape variety, environmental conditions, soil, degree of maturation of the grapes and crop technology. The amount of phenols in grapes contribute to the quality of the wine. The degree of maturation of the grapes is more advanced, the amount of phenolic compounds is higher [28]. Due to its organoleptic and biological characteristics, anthocyanins, flavonoids and stilbenes play a key role in wine quality and grape extracts are used as a source of natural compounds in the pharmaceutical, food and natural products [23].

A class of non flavonoid compounds which, although present in very small quantities in wine, matters is the stilbenes [4]. These compounds occur naturally in some food plant, as well as several species of the genus Vitis particularly in fruit peels in mature stage. Their synthesis is stimulated by infection with pathogens or abiotic stress response [2]. Some stilbene, particularly resveratrol, are believed to have benefits on human health.

The anthocyanins are "responsible" for red, purple or blue pigmentation of the grapes and consequently of the red wine. The structure of ordinary anthocyanins from grapes and wines of species V. vinifera was determined for the first time in 1959 [4].

Fig. 4. Distribution of the main components in grapes, important for wine quality (Coombe B.G., 1987) : Skin, Pulp, Seeds

Unlike proanthocyanidins, accumulation of anthocyan pigments in red grape varieties begins with the ripening and reaches its maximum in the last phase of ripening grain, when it also ends[39]. The anthocyanins are synthesized in the cytoplasm of epidermal cells, are co-located with proanthocyanidins in hypodermic layers of shell beans and then stored in the vacuole [15]. In some varieties, grain accumulation in the shell is made in parallel with pulp accumulation [13].

Polyphenolic compounds were studied in six varieties of grapes in the region of Macedonia in Vranec by Ivanova et al. (2010). Mostly, these compounds have been located in the seeds and skin of grapes and less in the pulp. The results showed that the highest total polyphenol content was found in seeds, between 113 mg / l Cabernet Sauvignon and 166 mg / l Vranec local variety. The highest flavonoid content of 15.8 mg / l was found in the seeds of the variety Riesling, while Vranec variety that dominates the vineyards of Macedonia, recorded the highest level of anthocyanins in the skin of grapes, 11.9 mg / l. Catechins have focused on the superior level, in the variety seeds Muscat Hamburg (24.2 mg / l).

Conclusions

In the EU (28) wine consumption per capita has been declining for years especially in southern Europe, where, as a result of changing lifestyles and tastes, anti-alcohol campaigns and care for health problems affected global demand.

In contrast, in the Nordic member states the share consumption has remained constant or increased slightly, particularly in the demand for quality wines. Another development is relevant in terms of the growing demand for bulk wine because of lower transport costs.

Although its beneficial effects, excessive consumption of wine leads to many shortcomings. At the end of the ninth century, people began to have a different view on alcohol, many who constantly drank wine becoming alcoholics. Medical studies found weather alcoholism a disease focused primarily on the effect of alcohol on the body due to consumption for a long period of time. Although both the red and the white grapes produce similar amounts of resveratrol, red wine has a higher content as red wines are produced by maceration. Other techniques for the wine, such as the use of yeast during the fermentation, influence the amount of resveratrol in wine [41].
While resveratrol is the star of the advertising world of wine, medical research turned in studying other components of wine with positive effects on health, such as catechins and quercetin [19]. Studies to date have shown that even a small amount of alcohol increases the risk of the occurrence of many types of cancer including breast, colon, esophagus or stomach cancer. With regard to the beneficial effects of the wine in the fight against cancer, they are referring to the antioxidant properties of resveratrol, some of the results obtained in the laboratory indicating its protective quality to inhibit cancer cells as a result of the reduction of estrogen production. Ongoing research did not bring conclusive results, although some studies suggest that consuming moderate amounts of wine may decrease the risk of ovarian, lung or prostate cancer[36].

Bibliography