

INTERACTION BETWEEN CLIMATIC FACTORS AND WINE QUALITY

Author:

Gabriela Teodorescu, Valahia University of Targoviste, Romania

E-mail: theo_0200@yahoo.com

Purpose of the study

The chemical components of wine can be analyzed in minute detail, but judgments of quality and character still rely on sensory evaluation.

Good wine satisfies the senses with its colour and texture, its aromas and flavours, those unique features sometimes referred to as aesthetic or artistic qualities. Wine also plays a role in social life, since it is habitually consumed in the company of others.

Wine quality evaluation by sensory analysis makes it possible to synthesize all the effects of agronomic and genetic factors on the final quality of wine and in this way the complexity of the wine quality model can be approached.

Methods

Climate can affect grapes by as little as a matter of yards. Each small area has its own micro-climate and study of this is vital when deciding where to site a new vineyard.

The effects of climatic factors on grape composition and wine quality is studied separately and therefore the complexity of the vineyard system is not fully appreciated.

The most important factors of variability in the vineyard (canopy manipulation techniques, cluster shading, soil characteristics, site of cultivation, plant mineral nutrition, cultivar and clone effects), that occur throughout the vegetative season and characterize the site of cultivation, act on vines by modifying the relationships between sources and sinks, specifically leaves and bunches. The vineyard and management systems have to be designed to ensure that the full potential of the site can be realised. The main design issues are vine density, row orientation, method of pruning, ground floor management, cropping levels, canopy management, soil moisture, pest and disease control.

Wine quality is the result of interactions between a large number of factors. In general the effects of these factors on grape composition and wine quality is studied separately:

After the sediment (including exhausted yeast cells) settles to the bottom of the barrel or tank, the wine is drawn off and put into a clean container again, leaving the sediment behind. This process is called racking and may be repeated several times during the wine's maturing period in the cellar. Later, the wine is also clarified, or fined. A precipitation agent, such as gelatin, is added at the top of the barrel; as it sinks to the bottom, the agent carries suspended matter, leaving the wine clear and bright. Finally, the wine is directed through a filtration system (or centrifuged), to remove all undesired elements.

The alcoholic fermentation is the first stage of winemaking, a complex biochemical phenomenon which involves transforming the sugars (glucose and fructose) into ethyl alcohol (ethanol), carbon dioxide and numerous products which are known as secondary products, because they are present only in small quantities.

The agents for this process are the yeasts in the grapes, which feed on the sugars and change them.

Malolactic fermentation starts after the alcoholic fermentation, in some cases immediately afterwards, sometimes in the spring or at the beginning of the summer after the grape harvest. It is the temperature of the wine, whether natural or controlled, which sets off this fermentation, but a great deal depends on the initial acidity of the grapes.

With malolactic fermentation the wine starts to change its organoleptic character; the colour develops a less lively tone, the perfumes gain new subtleties and the taste becomes rounder and fuller.

The biggest aromatic impact comes after fermentation, when the wine is racked off the skins and held for clarification and maturation before bottling.

There are wines which, after alcoholic fermentation and malolactic fermentation, are allowed to rest for a period (which may be longer or shorter) in wooden barrels (small barrels or large ones). This is a period when the wine acquires complexity as new aromas form. The intensity of aroma is of relative importance since it is basically a measure of quantity. In a fine wine a rich bouquet is an attribute; but in a bad wine a strong odor is a negative factor.

In Romania, the information about the ochratoxigenic mycoflora and ochratoxin (OTA) presence in wine grapes, wines, grape juices and dried vine fruits is limited. The role of *Aspergillus* section *Nigri* and *A. carbonarius* in OTA production was discovered in Europe in 1999. It seems that it is an important connection between climatic condition and level of OTA contamination in grapes and their influence in wine production.

Regarding this, one of the aim of this research is to identify the microbiological evolution of romanian wines on climatic change impact.

The yeates from grapes and wines have the capacity produce the biogenic amines. The highest concentration of total biogenic amines was formed by *Brettanomyces bruxellensis* followed by *Saccharomyces cerevisiae*.

Amines may be formed by yeasts during the alcoholic fermentation (mostly putrazine); by lactic acid bacteria (LAB) during malolactic fermentation (MLF) and during maturation of wines. The main biogenic amines in wine are histamine, tyramine, putrescine, cadaverine and phenylethylamine. Wines fermented with strains of *S. cerevisiae* species had the highest contents of ethanalamine and of agmatine.

Biogenic amines, including histamine, are primarily produced by both indigenous and commercial strains of lactic acid bacteria (LAB) in wine.

To investigate the origin of biogenic amines, 14 romanian wines of various origins were initially analyzed to determine their content of amino acids and biogenic amines. Of these wines, 6 containing varying concentrations of biogenic amines then underwent a complete analysis. The first results on the wine produced in south of Romania (Muntenia region) demonstate a medium content of histamine by 6.1mg/L in red varieties.

The difference in histamine concentration between red and white wine may also be attributed to different winemaking practices

Biogenic amines are important because they contain a health risk for sensitive individuals. Biogenic amines such as histamine might cause adverse reactions such as migraine headaches. Histamine is also involved in important allergic reactions. Also, can influence a variety of physiological processes.

Other aim of the research it was to determine the level of ethyl carbamate (EC) in romanian wines. The first observation was that red wine develop a high concentration of EC than white wine. In wine is formed by the spontaneous reaction between urea and ethanol. Because urea is the principal precursor of ethyl carbamate, controlling the urea concentration may be important in limiting ethyl carbamate levels. Urea is formed when the wine yeast metabolises arginine, a major alpha-amino acid in grape juice available to yeast. This reaction depend of the yeast strain. Also, the formation of ethyl carbamate increases exponentially with increases in temperature. Wines made from grape varieties which contain high levels of arginine can have relatively higher levels of ethyl carbamate.

The results obtained after 14 romanian wines investigation (from Muntenia region) show that the urea concentration varies from 1.01-2,13mg/litre and the EC concentration from 1,72 to 4,26 ppb in red wines. The white wine tend to have low EC concentration.

Summary of results

The possibility to determine the quality of wines based on their microbiological and chemical content will be investigated during this research.

The characteristics and quality of wines depend on multiple parameters comprising climatic and geological factors of production regions, grape varieties and maturation, technological practices. Except the organoleptic tests, analytical methods are being increasingly applied to wine characterization.

Some wine researchers propose to use of biogenic amines as potential descriptors of wine characteristics and quality.

The way wine smells and tastes depends on the grapes from which it is made, the alcoholic fermentation, and the processing and aging of the wine.

Younger wines can be distinguished from aged ones on the basis of the amine contents

The transformation of the grapes into a wine leads to it having hundreds of components, of which the vast majority are present only as minimal traces or in traces which may be considered negligible. The most important components of wine are:

Water (78 to 85 percent). The water in wine derives entirely from grape juice, so it is biologically pure.

Alcohols (10 to 17 percent). Alcohol is expressed as a percentage by volume. It has been proven that alcohol in moderate doses has beneficial effects on health. Alcohol is one of the elements which has the biggest effect on the quality of wine.

Acids (0.4 to 1 percent). In the mouth it is felt on the sides of the tongue, but the acidity which one finds in a wine is the result of a group of acidic substances, some from the grape and others from the fermentation process.

Sugars. Grapes contain 15 to 25 percent glucose and fructose, sugars that are mainly converted to alcohol through fermentation. In dry wines a trace of residual sugar (0.1 percent) is normal, sweet wines may contain them at up to 10 percent.

Mineral salts (0.2 to 0.4 percent). Salts derived from mineral acids or organic acids lend freshness to the flavor of wine.

Flavoring and coloring substances (0.01 to 0.5 percent). Phenolic compounds give wines color and account for differences in flavor between reds and whites.

Odoriferous substances. Traces of diverse chemical compounds of a volatile nature account for certain odors in wine. These include alcohols, aldehydes, esters, acids and ketones.

Yeasts. There are thousands of types, all natural, all 'selected', but each with different roles. It is the yeasts, groups of micro organisms which can cause fermentation through the enzymes they produce. Those present on grapes, called wild or ambient yeasts, are capable of starting must fermentation on their own.

While a number of factors impact upon the quality of a vintage, the weather is a major factor. There has to be enough heat during the growing season to produce sufficient sugar in the grapes to allow for good fermentation.

To produce a great wine the grapes must be ripe at the time of harvest and generally have a high sugar content. If it rains right when the grapes are ready to be picked, the result can be an increase in the water content of the grapes and a reduction in their sugar content, which generally will produce a poorer wine.

The winemaker must be able to harvest the crop at the optimal time - and this is not always possible because of poor weather conditions. If the winemaker harvests too early there will likely be not enough sugar in the grapes to convert to alcohol, resulting in a wine too low in alcohol content or "thin". Leave the grapes too long and the sugar content is likely to be too high resulting in too much acid in the grapes. This affects both the taste of the resulting wine and its ability to age properly.

Obviously the climate and weather conditions vary dramatically between geographical areas, so what could be described as a "great vintage" for one region may not be true for another.

Conclusion

In present, the modern consumer is much more health conscious. The real health risks posed by biogenic amines and EC in Romanian wines and not only, are very difficult to assess at this time. As a recommendation, not use crops that add nitrogen to the soil and choose the correct yeast. Because the ethyl carbamate formation is exponentially increased at elevated temperatures, it is very important to use the correct storage and transport system. Maintenance of the correct cold chain is essential.

While technological improvements in grape growing and wine making have led to higher quality wines, climate is the wild card that determines year to year quality differences. The estimation of the relationships between vegetative and productive performances of vines may be successfully linked to the quality potential of the vineyard.

The influence of grape variety, type of vinification, wine pH, malolactic fermentation, and storage in bottle on biogenic amine concentrations will be studied.

The next results have to show the important differences in putrescine and histamine concentrations among romanian wine regions, varieties of grape, and type of wine.

The terms 'quality' is very used in reference to wine. Wine quality is, in large measure, determined by the grape and the winemaker. Grapes characteristics are governed principally by the combination between soil and climate, influencing grape chemistry and subsequent wine quality.

The wine quality its a complex process, because a wine consists of over 300 different chemical compounds, many of which are identical or similar to those found in fruits, vegetables, spices, herbs, and other substances.

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The wines of superior quality (VS) are produced from grape varieties with high quality potential, grown in specific viticulture regions. Superior quality wines with controlled appellation of origin (VDOC) are produced from grape varieties authorized and recommended for growth in each particular region, under very well established criteria, referring to: viticulture areas, variety or assortment of varieties, method of growing, maximum yield per hectare, technical and quality control.

According to the regulations of the Romanian Office of the Vine and Wine, the wines with the appellation of origin need to be: minimum 1-2 years old for white wines and minimum 2-3 years old for red wines. For half of this time, the wines have to be kept in oak casks.

Romanian law recognizes the following categories for wines: Wines for current consumption: Table wine (VM), Superior table wine (VMS); Quality wines: Wine of superior quality (VS), Quality wine with controlled appellation of origin (VDOC), Wine with controlled appellation of origin (DOC), Wine with controlled appellation of origin and quality degree (DOCC).

According to the sugar content, wines can be classified as follows: dry (up to 4 g/l), medium-dry (4-12 g/l), medium-sweet (12-50 g/l), sweet (over 50 g/l).

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