Wine quality production and sustainability in the frame of biodiversity

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1

Organic agricultural production

Aims of organic farming :

Organic farming is an agricultural method that aims to produce food using natural substances and processes. This means that organic farming tends to have a limited environmental impact as it encourages:

- **the responsible use of energy and natural resources;**
- **the maintenance of biodiversity;**
- **preservation of regional ecological balances;**
- **enhancement of soil fertility;**
- **maintenance of water quality.**

Additionally, organic farming rules encourage a high standard of animal welfare and require farmers to meet the specific behavioural needs of animals.

European Union regulations on organic farming are designed to provide a clear structure for the production of organic goods across the whole of the EU. This is to satisfy consumer demand for trustworthy organic products whilst providing a fair marketplace for producers, distributors and marketers.

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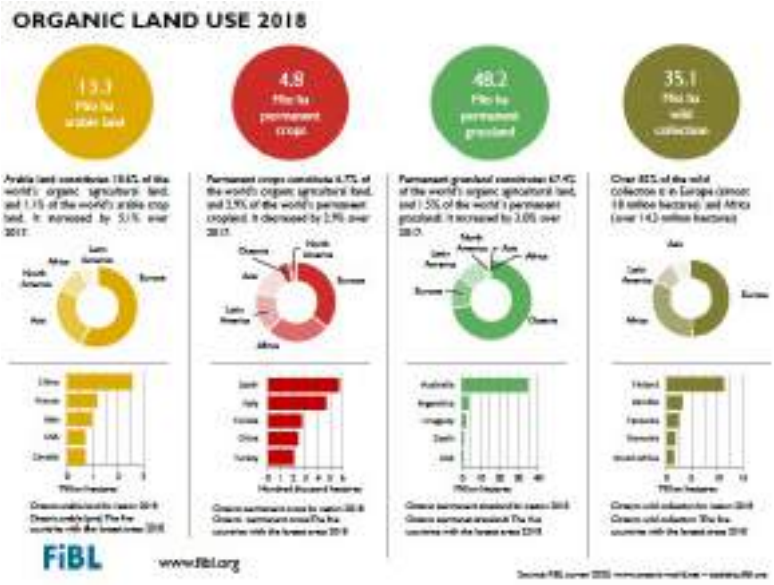
Organic agricultural production



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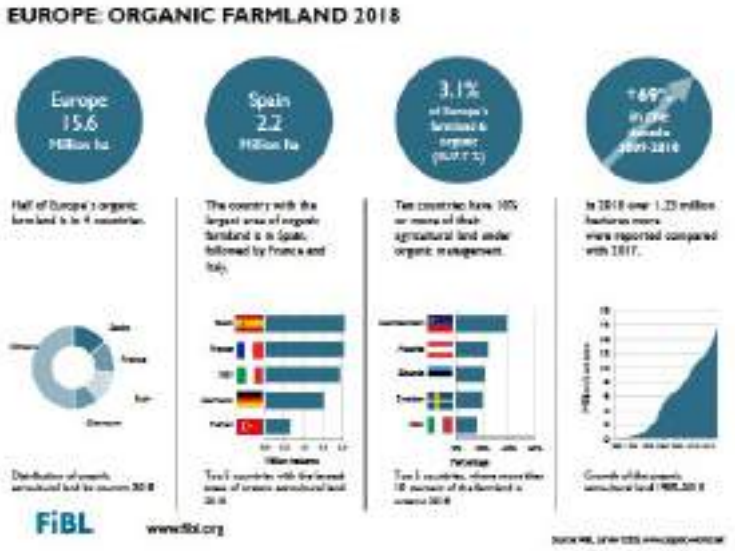
Organic agricultural production



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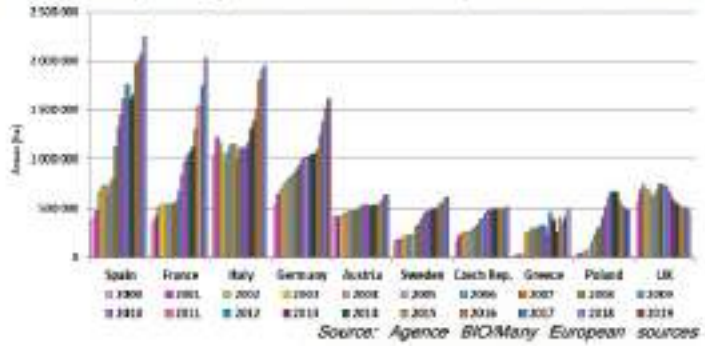
Organic agricultural production

Evolution of areas grown organically (certified organic areas and in-conversion) in the top 10 producing countries of the European Union since 2000



Source: Agence BIO/Many European sources

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Organic Vines and Wines

World: Organic grapes area 2018

- More than 422'000 hectares of organic grapes are grown, constituting 6.1 percent of the world's grape-growing area (6.9 million hectares in 2017, according to FAOSTAT). In Europe, over 365'000 hectares (9.5 percent of the harvested grape area) are organic.
- Not all of the grape area listed in the table is used for wine. The production of table grapes and raisins is important in many countries, such as Turkey. All of the five most important grape-growing countries in the world (Spain, China, France, Italy, and Turkey) provided data on the area under organic grape production in 2018.
- The countries with the largest organic grape areas are Spain and Italy, each with more than 100'000 hectares of organic grapes, followed by France with over 94'000 hectares. Some of the highest organic shares of the total grape area are also found in these countries. Almost 90 percent of the world's organic grape area is in Europe, 5 percent in Asia and the rest is distributed almost equally among Africa, North America, Oceania, and Latin America.
- Since 2004, when data on land use and crops were collected for the first time, the organic grape area has increased almost five-fold. However, some of the increase can be attributed to the continually improving availability of crop data.
- The available data indicates that a large part of the organic grape area (at least 24 percent) is in conversion. Thus, a considerable increase in the supply of organic grapes may be expected, particularly from Spain, Italy, and France.

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Organic Vines and Wines

World: Organic grapes: Global distribution 2018

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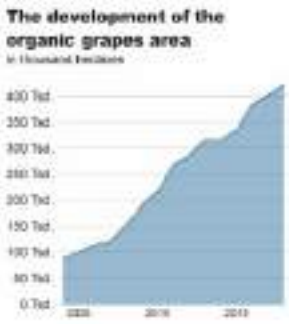
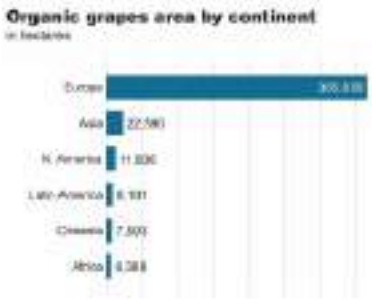
Organic Vines and Wines

World: Development of the organic grapes area and area by continent 2018





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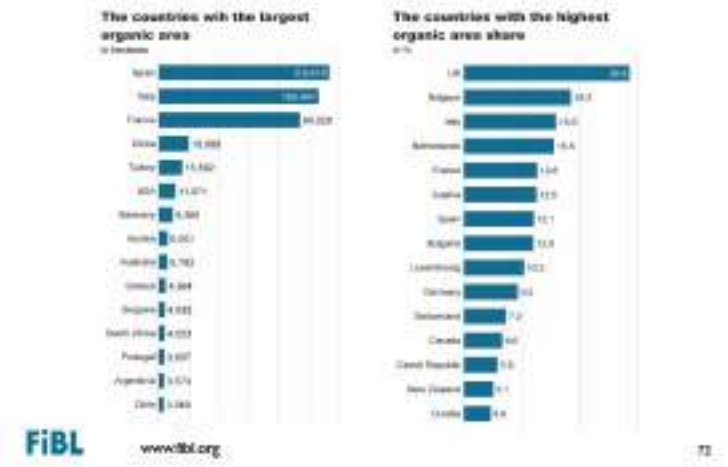
Organic Vines and Wines

World: Countries with the largest organic grapes area and highest organic grapes area share 2018



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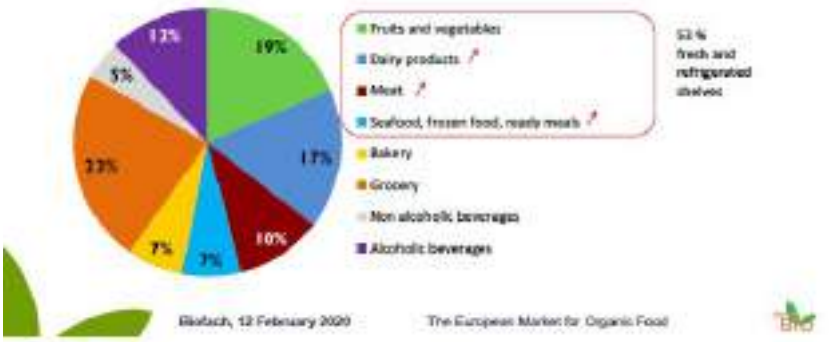
Organic Vines and Wines

Product shares in the organic food market



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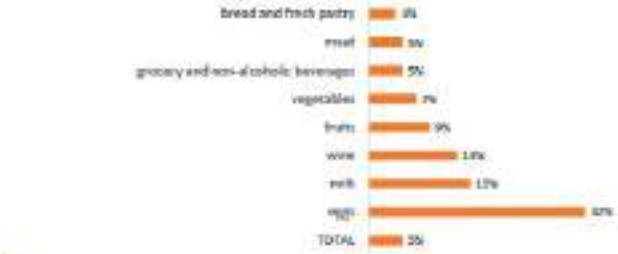
Organic Vines and Wines

Share of organic products in their market



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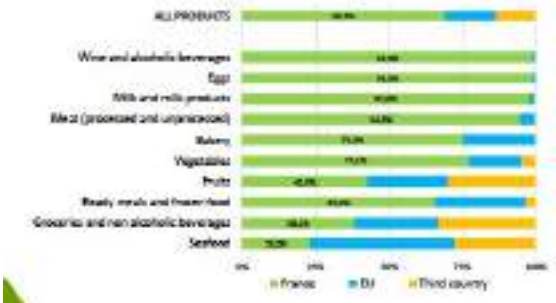
Organic Vines and Wines

Origin of organic food consumed in France



- A fair national supply consistent with the consumers' demand
- Fruits: banana, citruses and some exotic
- seafood: shrimps and salmon
- groceries and juices: sugar, olive oil, citruses

Diversity and dynamism of French organic production and structuring

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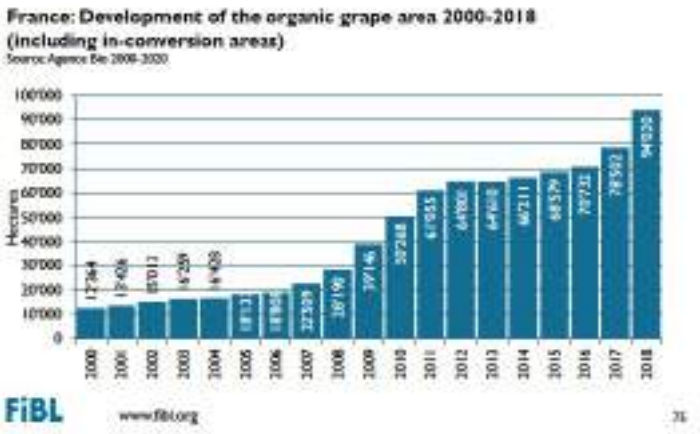
Organic Vines and Wines

France: Development of the organic grape area 2000-2018 (including in-conversion areas)



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Organic Vines and Wines

- Organic wines are made from grapes which are cultivated without recourse to synthetic fungicides, herbicides or fertilizers.
- In vineyards where the environment is respected and biodiversity encouraged, the vines grow in a living soil, full of worms and bacteria. This enables them to draw upon the optimum levels of minerals from the soil. In turn, these healthy vines develop better resistance to disease and go on to produce fruit for years to come.

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Organic Vines and Wines

- How do we know it's organic and or biodynamic?
- The policy is only to stock goods from producers who have paid for and achieved certification, giving them the right to describe themselves as 'organic' or 'biodynamic'. Certification gives us and you a guarantee that no chemical fertilizers, synthetic pesticides or herbicides have been used on the vines.
- To gain organic certification, all producers undergo inspection by organisations such as the Soil Association in England, Ecocert in France and the CCOF in California. Standards are rigorously maintained and spot-checks can take place at any time during the year.
- The Demeter Association certifies biodynamic vineyards and its symbol can be seen on some wines.
- Please visit www.biodynamics.com for more information on biodynamics. Vintage Roots - What are organic wines? http://www.vintageroots.co.uk/organic.asp

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Organic Vines and Wines

- The organic vineyard - a bug's eye view

- Biodiversity is encouraged by planting cover crops between the rows of vines. Not only does this create an eye-catching landscape, but more importantly they bring a host of beneficial visitors.
- For instance, plum trees are planted in organic vineyards in California to attract Anagrus wasps that then eat the destructive vine leafhoppers, which can cause massive crop damage if not controlled.
- Certain biodegradable sprays are used from time to time and there are biological controls such as the planned release of ladybirds which eat vine aphids. Mildew problems may also be managed with salts such as copper sulphate and elemental (not man made) sulphur

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Organic Vines and Wines

- Biodynamics : an extra dimension ?
- Firmly rooted in the teachings of Rudolf Steiner, biodynamics goes one step beyond organics by looking at the vineyard within the context of the larger environment.
- Homeopathic sprays and herbal preparations are used along with estate-made composts to increase soil fertility and strengthen and protect the vines from pests and disease.
- Lunar cycles, earth rhythms and astrology are also employed to ensure that activities in the vineyard are correctly timed.

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Organic Vines and Wines

- What is reconversion?
- This is the process of converting from a conventionally-maintained vineyard to one that is fully organic.
- Reconversion for vineyards takes three years because the grapevine is a perennial plant, whereas only two years are required for annual crops like wheat or vegetables.
- Right from the start of reconversion, the vineyard must be cared for 100% organically.
- Any non-organic treatments are strictly prohibited and their use would take the estate right back to the beginning again.

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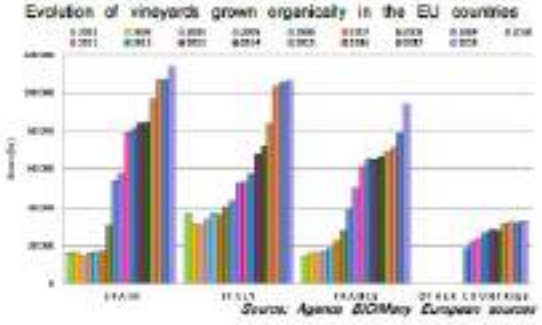
Organic Vines and Wines

Viticulture: nearly 347,600 ha of vines grown organically in the EU in 2018

- The EU vineyard grown organically increased by 3% in 2017, exceeding 323,300 ha. It must have reached 347,600 ha in 2018 (up 8%), i.e. 2.5% of the EU area grown organically and 11.1% of the EU vineyard.

Evolution of vineyards grown organically in the EU countries



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Organic Vines and Wines

Organic vineyards of the main producing countries of the European Union

Countries		Spain	Italy	France	Germany	Austria
Areas grown organically (in ha)	2017	106,897	105,384	78,852	7,200	5,718
	2018	113,419	106,447	94,020	7,600	6,681
Share of the EU vineyard grown organically	2017	33.1%	32.0%	23.2%	2.3%	1.8%
	2018	32.6%	30.6%	27.0%	2.2%	1.7%
In-conversion share	2017	29%	32%	22%	Unknown	Unknown
	2018	21%	30%	31%	Unknown	Unknown
Share grown organically	2017	11.6%	15.0%	10.0%	7.2%	12.7%
	2018	12.1%	15.9%	12.0%	9.2%	14.2%
Share dedicated to wine grapes/	2017 & 2018	98.7%	97.9%	98.1%	Unknown	Unknown
Main production regions	2018	Castilla-La Mancha (52%)	Sicily (29%)	Occitanie (37%)	Rhineland-Palatinate	Lower Austria (55%) & Burgenland (35%)

Source: Agence BIO/Many European sources

- Almost all of the Spanish, Italian and French organic vineyards are dedicated to wine grapes. According to IWSR/Millésime Bio, the production of organic wines in Italy, Spain and France approached 10.6 million hl in 2018, including more than 5 million hl for Italy.

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Organic Vines and Wines

- The EU top 4 markets (in volume) for organic still wine are Germany, France, United Kingdom and Sweden.
  - The German market for organic still wines represented 1.2 million hl in 2017 (around 6% of the national market for still wines). Between 2012 and 2017, organic sales increased by 17.9% on average per year. Germany is the world's leading organic wines importer. The main origins of imported organic wines are Spain, Italy and France. Germany is the main destination for Spanish and Italian organic wines. According to IWSR/Millésime Bio, Germany nevertheless exported 12% of its organic wine production in 2018.

The 1st marketing network is organic shops, followed by mass distribution. The latter has started to develop its organic wines range. 4% of Germans regularly buy organic wines. Light red wine is the organic wine the most bought by German consumers.
German wines represented 52% of the organic market in volume in 2018, ahead of Italian (20%), French (16%) and Spanish (6%) wines.

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Organic Vines and Wines

- Italy exports a significant share of its organic wine. However, consumption is growing. The organic still wine market was 117,000 hl in 2017. In the 1st half of 2019, organic wines sales (without restaurants) increased by almost 39% in value compared to the 1st half 2018. The organic wines market share was 1.4% in value in the 1st half of 2019. Red wines remain the organic wines preferred by Italian consumers. As in France, organic wines are often purchased directly from the producer. Almost all of the organic wine consumed in Italy comes from the country.
- The majority of Spanish wines is exported. However, the organic share in the wine market reached 5.0% in 2017 (0.6% in 2012). Around 117,000 hl of organic still wines were consumed in 2017. According to IWSR/Millésime Bio, the Spanish market should take off by 2023.

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Organic Vines and Wines

- According to AND-I, the French organic wine market (excluding catering) amounted to 1.3 million hl in 2018 for € 1.05 billion, up 10% compared to 2017. Organic share was 12.5% in value and 4.0% in volume. The organic wines consumed are mainly French. French consumers often buy their organic wines directly (41% of the market in value in 2018).
According to the 2018 edition of the BIO/CSA Agency Barometer on the consumption and perception of organic products, 18% of people consuming organic products at least once a month drank organic wine in 2018, 13% of consumers of organic wines drink only this type of wine and, for 41%, organic wines represent more than ½ of their wine consumption. Red wines represented ½ of the volumes of organic still wines consumed in France in 2017, rosé wines 32% and white wines 18%.
According to IWSR, more than 800,000 hl of organic still wines were consumed in France in 2017, almost a quadrupling compared to 2012. France exported 0.96 million hl of organic wine in 2018.
According to IWSR/Millésime Bio, France should become the 1st organic wine market worldwide from 2023 with ⅓ of the total.

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CODEX ALIMENTARIUS

- The Codex Alimentarius Commission, established by FAO and WHO in 1963 is an intergovernmental body with over 180 members, **and develops harmonised international food standards, guidelines and codes of practice to protect the health of the consumers and ensure fair practices in the food trade.**
- The Commission also promotes coordination of all food standards work undertaken by international governmental and non-governmental organizations.
- **The Codex Alimentarius (Latin, meaning Food Law or Code) is the result of the Commission's work: a collection of inter-nationally adopted food standards, guidelines, codes of practice and other recommendations**

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GUIDELINES FOR THE PRODUCTION, PROCESSING, LABELLING AND MARKETING OF ORGANICALLY PRODUCED FOODS

- **GL 32–1999**

- *Guidelines* include general sections describing :

-the organic production concept and the scope of the text;
-description and definitions;
-labelling and claims (including products in transition/conversion);
-rules of production and preparation, including criteria for the substances allowed in organic production;
-inspection and certification systems; and import control.

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GUIDELINES FOR THE PRODUCTION, PROCESSING, LABELLING AND MARKETING OF ORGANICALLY PRODUCED FOODS

- **GL 32–1999**

These guidelines set out the principles of organic production at farm, preparation, storage, transport, labelling and marketing stages, and provides an indication of accepted permitted inputs for soil fertilizing and conditioning, plant pest and disease control and, food additives and processing aids. For labelling purposes, the use of terms inferring that organic production methods have been used are restricted to products derived from operators under the supervision of a certification body or authority.

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GUIDELINES FOR THE PRODUCTION, PROCESSING, LABELLING AND MARKETING OF ORGANICALLY PRODUCED FOODS

- **GL 32–1999**

- Organic agriculture is one among the broad spectrum of methodologies which are supportive of the environment.
- Organic production systems are based on specific and precise standards of production which aim at achieving optimal agroecosystems which are socially, ecologically and economically sustainable.
- Terms such as “biological” and “ecological” are also used in an effort to describe the organic system more clearly.

- Requirements for organically produced foods differ from those for other agricultural products in that production procedures are an intrinsic part of the identification and labelling of, and claim for, such products.

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GUIDELINES FOR THE PRODUCTION, PROCESSING, LABELLING AND MARKETING OF ORGANICALLY PRODUCED FOODS

- **GL 32–1999**

"Organic" is a labelling term that denotes products that have been produced in accordance with organic production standards and certified by a duly constituted certification body or authority.

Organic agriculture is based on minimizing the use of external inputs, avoiding the use of synthetic fertilizers and pesticides.

Organic agriculture practices **cannot ensure that products are completely free of residues, due to general environmental pollution.**

However, methods are used to minimize pollution of air, soil and water.

Organic food handlers, processors and retailers adhere to standards to maintain the integrity of organic agriculture products.

The primary goal of organic agriculture is **to optimize the health and productivity of interdependent communities of soil life, plants, animals and people.**

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GUIDELINES FOR THE PRODUCTION, PROCESSING, LABELLING AND MARKETING OF ORGANICALLY PRODUCED FOODS

- **GL 32–1999**

- Organic agriculture is a holistic production management system which promotes and enhances agroecosystem health, including biodiversity, biological cycles, and soil biological activity.

- It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems.

- This is accomplished by using, where possible, cultural, biological and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system

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GUIDELINES FOR THE PRODUCTION, PROCESSING, LABELLING AND MARKETING OF ORGANICALLY PRODUCED FOODS

- **GL 32–1999** An organic production system is designed to:

- **a) enhance biological diversity within the whole system;**
- **b) increase soil biological activity;**
- **c) maintain long-term soil fertility;**
- **d) recycle wastes of plant and animal origin in order to return nutrients to the land, thus minimizing the use of non-renewable resources;**
- **e) rely on renewable resources in locally organized agricultural systems;**
- **f) promote the healthy use of soil, water and air as well as minimize all forms of pollution thereto that may result from agricultural practices;**
- **g) handle agricultural products with emphasis on careful processing methods in order to maintain the organic integrity and vital qualities of the product at all stages;**
- **h) become established on any existing farm through a period of conversion, the appropriate length of which is determined by site-specific factors such as the history of the land, and type of crops and livestock to be produced.**

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GUIDELINES FOR THE PRODUCTION, PROCESSING, LABELLING AND MARKETING OF ORGANICALLY PRODUCED FOODS

- **GL 32–1999**
- The concept of close contact between the consumer and the producer is a long established practice. Greater market demand, the increasing economic interests in production, and the increasing distance between producer and consumer has stimulated the introduction of external control and certification procedures.

- **An integral component of certification is the inspection of the organic management system.** Procedures for operator certification are based primarily on **a yearly description of the agricultural enterprise as prepared by the operator in cooperation with the inspection body.** Likewise, at the processing level**, standards are also developed against which the processing operations and plant conditions can be inspected and verified.**
- Where the inspection process is undertaken by the certification body or authority, there must be **clear separation of the inspection and certification function.** In order to maintain their integrity, certification bodies or authorities which certify the procedures of the operator should be independent of economic interests with regard to the certification of operators.

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GUIDELINES FOR THE PRODUCTION, PROCESSING, LABELLING AND MARKETING OF ORGANICALLY PRODUCED FOODS

- **GL 32–1999**
- **A product will be regarded as bearing indications referring to organic production methods where, in the labelling or claims, including advertising material or commercial documents, the product, or its ingredients, is described by the terms "organic", "biodynamic", "biological", "ecological", or words of similar intent including diminutives which, in the country where the product is placed on the market, suggests to the purchaser that the product or its ingredients were obtained according to organic production methods.**
- 1.3 Paragraph 1.2 does not apply where these terms clearly have no connection with the method of production.
- 1.4 These guidelines apply without prejudice to other Codex Alimentarius Commission (CAC) provisions governing the production, preparation, marketing, labelling and inspection of the products specified in paragraph 1.1.
- 1.5 **All materials and/or the products produced from genetically engineered/modified organisms (GEO/GMO) are not compatible with the principles of organic production (either the growing, manufacturing, or processing) and therefore are not accepted under these guidelines.**

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GUIDELINES FOR THE PRODUCTION, PROCESSING, LABELLING AND MARKETING OF ORGANICALLY PRODUCED FOODS

- **GL 32–1999**
- **Description**
- Foods should only refer to organic production methods if they come from an organic farm system employing management practices which seek to nurture ecosystems which achieve sustainable productivity, and provide weed, pest and disease control through a diverse mix of mutually dependent life forms, recycling plant and animal residues, crop selection and rotation, water management, tillage and cultivation.
- **Soil fertility is maintained and enhanced by a system which optimizes soil biological activity** and the physical and mineral nature of the soil as the means to provide a balanced nutrient supply for plant and animal life as well as to conserve soil resources.
- **Production should be sustainable** with the recycling of plant nutrients as an essential part of the fertilizing strategy. **Pest and disease management is attained by means of the encouragement of a balanced host/predator relationship, augmentation of beneficial insect populations, biological and cultural control and mechanical removal of pests and affected plant parts.**
- The basis for organic livestock husbandry is the **development of a harmonious relationship between land, plants and livestock, and respect for the physiological and behavioural needs of livestock.** This is achieved by a combination of providing good quality organically grown feedstuffs, appropriate stocking rates, livestock husbandry systems appropriate to behavioural needs, and animal management practices that minimize stress and seek to promote animal health and welfare, prevent disease and avoid the use of chemical allopathic veterinary drugs (including antibiotics).

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Substances authorized for use for organic wines production

- One of the most disputed additives within the organic wine industry is the sulphite compound.
- Sulfites are added to wine as preservatives to prevent spoilage during several stages of the winemaking. Sulfur dioxide (SO2) protects wine from oxidation and bacterial growth. The Table clarifies the maximum allowed sulphur dioxide levels in the EU.

However, the maximum sulphur dioxide content in organic wines have exceptions and limitations that are explained precisely in the EU commission implementing regulation EC No 203/2012 and EC No 606/2009.

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Limitations for sulphur dioxide content in organic wines (EC No 203/2012; EC No 606/2009).

Wine category	Residual sugar	Max SO2
Red	< 2 g/l	100 mg/l
Red	> 2g/l	170 mg/l
White and rosé	< 2 g/l	150 mg/l
White and rosé	> 2g/l	220 mg/l
Liqueur	< 5 g/l	120 mg/l
Liqueur	> 5g/l	170 mg/l
Quality sparkling		155 mg/l
Other sparkling		205 mg/l
Sweet (spätlese, auslese, etc.)		270-370 mg/l

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Limitations for sulphur dioxide content in organic wines (EC No 203/2012; EC No 606/2009).

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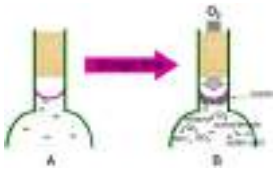
Properties of SO_2



Microbiological actions
-Major role of Active SO_2 / pH

Pre-fermentation phase
Post fermentation phase
"Pre-bottling" phase

Antioxidant actions
-Chemical and enzymatic oxidation

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SO_2

- The maximum sulphur content should be lower than the level in non-organic wines.
- Generally the necessary quantities of sulphur dioxide depend on the type of wine and content of residual sugars.
- However, increasing the maximum sulphur dioxide content is allowed in certain situations. For example, sometimes extreme weather conditions may provoke difficulties in certain wine-growing areas making it necessary to use additional amounts of sulphites to achieve stability of the final product. (EC No 203/2012)

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The EU has ruled the exact opposite of the US: that "organic wine" can contain sulfites.

Organic Labeling and Wine Sulfite Content

for organically grown grapes and winemaking processes

Region	Red	White	Label
EU			
Less than or equal to	100 mg/l	150 mg/l	Organic wine
Greater than	100 mg/l	150 mg/l	Wine from organic grapes
US			
Less than or equal to	10 mg/l	10 mg/l	Organic wine
Greater than	10 mg/l	10 mg/l	Wine from organic grapes

Chart by bienalytics.pro

The EU will restrict the amount of sulfites they may contain:
100 ppm total for red wine,
150 ppm for white or rosé,
as opposed to the 10 ppm allowed (and only when naturally occurring) in U.S. "organic wine."
(Conventional wines in the US are allowed 350 ppm.)

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What sulfite levels are organic?

- The EU regulations allow sulfite amounts equal to about 1/2000th of an ounce of sulfites in a glass of wine or about the equivalent of a drop of water in a half liter bottle.
- **Canada has also established an "organic" standard of 100 mg/l.** For organic wines that exceed this level, EU regulations allow them to petition to use the EU's previously approved "wine issued from organic grapes."

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"wine made from organically grown grapes"

- EU "organic wine" will have restrictions on winemaking - including no addition of sorbic acid - in addition to restrictions on viticulture.
- European consumers who prefer to drink wine that's closer to being a natural product, but who don't want their wine to taste spoiled, will now have the benefit of official certification.

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"Organic wine" cannot have added sulfites in the USA

- The small community that makes USDA-labeled "organic wine" won a crucial, final to protect its market share.

- The National Organic Standards Board voted to continue to prohibit sulfites from being added to « organic wine » in december 2011.

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"Organic wine" cannot have added sulfites in the USA

- **So EU organic wine labels can't be put on the wine bottle for US Market has EU these wines won't meet US standards.**

Paradox :

An Organic wine in EU is different of an Organic wine in the US because of SO2 levels

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Natural Wine French Charter

- charte of production by some french producers " Vin méthode nature" where the production method is defined as well as labelling :
- 1 • 100% of the grapes (of all origins: AOPs, Vin de France, etc.) intended for a wine claiming to be a "natural method wine" must come from committed and certified organic farming (Nature & Progrès, AB, or 2nd year of conversion AB at minimum).

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- 2 • The harvest is manual.
- 3 • Organic wines are vinified only with indigenous yeasts.
- 4 • No input is added.
- 5 • No intentional modification of the constitution of the grape is authorized.
- 6 • No use of brutal and traumatic physical techniques (reverse osmosis, filtrations, tangential filtration, flash pasteurization, thermovinification, etc.) is allowed.

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Natural Wine French Charter

- 7 • No sulphites are added before and during fermentation, or in the starter.
- (Possibility of adjustment - of the order of: SO2 <30 mg / l Total H2SO4, whatever the color and type of wine - before placing; obligation to provide information on the addition of sulphites, mentioned on the label via a dedicated logo.)
- 8 • During a "natural method wine fair", both the winegrowers and the organizers undertake to present the charter alongside the bottles; independent wine merchants are encouraged to do the same, as far as possible, within their establishment.

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Natural Wine French Charter

- 9 • Use of one of the identification logos.
- Can be used for wines without added sulphites (no external addition of sulphites)
- With Validation of Frantz Paul analyzes up to 20 mg / L to accept the "manufacture" of natural sulphites.

- Second logo
- • To be used as soon as there is addition of sulphite, even in small quantities (<10 mg)
- • Use up to 30 mg / L of sulphites (Frantz Paul analysis)
- 10 • The commitment will be made during the "marketing" (obligation of result) by a "declaration of honor", following the opinion of the Syndicate office; it will be requested each year for each vintage (clearly identified batch).

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Natural Wine French Charter

- **11 • Cuvées that are not "Wines method nature" must be clearly identifiable (differentiated labeling) by the signatories.**
- **12 • The signatories will undertake in their own name and all information**
- **We can see in these rules that they can be considered as organic wines with more restrictions.**
- **It means less protection for some risks**

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Risks

Paper from French Oenologists

POSITION DES ŒNOLOGUES DE FRANCE

LES NOUVEAUX COURANTS D'EXPRESSION DANS LE VIN

PAR LES ŒNOLOGUES DE FRANCE

PRÉAMBULE

ET DEVANT LEUR NOMBRE, COMMENT LES DISTINGUER, S'Y RETROUVER ?

Boom in the supply of so-called natural wines, close to 2% of current French wine production, responds to a search for authenticity and a health promise, essentially through the reduction of inputs, particularly sulphites.

Various alterations that had disappeared with the contribution of oenological science are encountered again and can be elevated to the rank of qualities!

The faults, whether they are related to the quality of the grapes, to "fermentation letting go, or to a technical failure, are numerous and inexorably lie in wait for the winemaker; thus reappeared:

-The taste of mice generated by strains of yeast of the Brettanomyces type and of certain Lactobacillus;

-The turn of microbial origin, lactic acid bacteria attacking tartaric acid to give wines without acidity but rich in CO2;

-Bitterness caused by a bacterial attack on glycerol to give acrolein (toxic);

-Fat disease, lactic acid bacteria of the genus Pediococcus producing glucans which make wine oily.

-Ethyl acetate produced by oxidative yeasts and weaklier by those used in wine making;

- In addition, ethanal, produced by yeasts (nutritional deficiencies in particular promote their formation) during AF and by oxidation during aging, toxic at high concentration, must be controlled and SO_2 in this case, remains an essential ally with the technical mastery of the moment of its addition.

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Risks

Paper from French Oenologists

POSITION DES ŒNOLOGUES DE FRANCE

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PRÉAMBULE

- In addition, ethanal, produced by yeasts (nutritional deficiencies in particular promote their formation) during AF and by oxidation during aging, toxic at high concentration, must be controlled and SO_2 in this case, remains an essential ally with the technical mastery of the moment of its addition.

- The greatest danger for the consumer lies in the misinformation which tends to qualify the worst taste defects born of alterations as characteristics of terroir and authenticity.

- We cannot allow these depreciations and alterations to be confused with the proclaimed authenticity and the return to a product called natural when it may be naturally degraded, or even non-compliant with regulations. That is to say "unfair and no merchant" to use the term.

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Recent paper in OENO ONE : « Sensory characterisation of Bordeaux red wines produced without added sulfites »

Sensory characterisation of Bordeaux red wines produced without added sulfites

Éduard Pelonnier-Magimel[1], Pinelopi Mangiorou[1], Philippe Darriet[1], Gilles de Revel[1], Michaël Jourdes[1], Axel Marchal[1], Stéphanie Marchand[1], Alexandre Pons[1,*], Laurent Riquier[2], Pierre-Louis Teissedre[1], Cécile Thibon[1], Georgia Lytra[1], Sophie Tempère[1] and Jean-Christophe Barbe[1]

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ABSTRACT

Aim: The evolution of consumer expectations has led to the development of new production methods using low inputs. From an oenological point of view, these methods include the production of wines without any SO_2 being added throughout the process. These wines are becoming very popular among consumers, but the absence of SO_2 during winemaking increases the risk of stability problems. Such wines have been poorly explored in the literature and there is thus a real need for them to be characterised. This study was developed to evaluate whether Bordeaux quality wines produced without added SO_2 have their own typicality, and it provides an insight into current wine production.

Methods and results: From a batch of fifty-two commercial Bordeaux red wines produced without adding SO_2 and twenty red wines made according to the usual winemaking methods, a selection tasting was performed to eliminate wines with at least one defect further to a sensory space evaluation. In a second phase, the napping test was applied to defect-free wines to evaluate the sensory specificities of wines produced without SO_2 addition. The wines without SO_2 addition presented a much higher frequency of defects than those with SO_2 (70 % vs 15 % respectively). Defects described in wines without added SO_2 were: "Oxidation" (47 %), "Volatile phenols" (31 %), "Musty-off-flavor" (10 %), "Reduction" (8 %) and "Vegetable" (4 %). Since the study focused on quality wines with or without SO_2 addition, it was difficult for the tasters to discriminate between them according to their overall technical judgment.

Conclusions: This approach has revealed that despite the large number of "non-added SO_2" wines with defects, upon blind tasting, expert tasters highlighted some "non-added SO_2" wines without defects. Nevertheless, at equivalent quality levels within the same geographic region, and in non-targeted sensory tests, wines with and without SO_2 addition were considered to be quite similar.

Significance of the study: This study was a first sensory step toward the objective characterisation of "non-added SO_2" wines, enabling further work to highlight markers of quality in wines without SO_2 addition and to develop the production of "non-added SO_2" wines without defects. Nevertheless, at this stage, our results show that the absence of sulfites during the whole winemaking process, including bottling, increases the risk of the development of defects.

KEYWORDS

wines without sulfites, wine defects, sensory analysis, napping, range task

52 commercial Bordeaux red wines produced without adding SO_2

and

20 red wines made according to the usual winemaking methods,

a selection tasting was performed to eliminate wines with at least one defect further to a sensory space evaluation.

In a second phase, the napping test was applied to defect-free wines to evaluate the sensory specificities of wines produced without SO_2 addition

Pelonnier-Magimel E., Mangiorou P., Philippe D., de Revel G., Jourdes M., Marchal A., Marchand S., Pons A., Riquier L., Teissedre P.-L., Thibon C., Lytra G., Tempère S., & Barbe J.-C. (2020). Sensory characterisation of Bordeaux red wines produced without added sulfites. OENO One, 54(4), 733-743. https://doi.org/10.20870/oeno-one.2020.54.4.3794 52

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RECENT PAPER IN OENO ONE : SENSORY CHARACTERISATION OF BORDEAUX RED WINES PRODUCED WITHOUT ADDED SULFITES

Frequency of wines with at least one defect according to use of sulfites and vintage.

	2015		2016	
	Wine with SO_2	Wine without SO_2	Wine with SO_2	Wine without SO_2
Number of wines with defect	61-dec	30/36	8/12	33/36
Percentage of wines with defect	33%	77%	8%	69%

	2015	2016	Total
Oxidation	37.5 %	33.3 %	35.4 %
Volatile phenols	20.8 %	16.6 %	18.7 %
Mousy off-flavor	12.5 %	0%	6.2 %
Reduction	4.1 %	8.3 %	6.2 %
Vegetable/Herbaceous	0%	8.3 %	4.1 %
Total	74.9 %	66.5 %	70.6 %

Citation frequencies and word cloud of descriptors of defects in wines without added sulfites, with agreement above 60 %

Pelonnier-Magimel E., Mangiorou P., Philippe D., de Revel G., Jourdes M., Marchal A., Marchand S., Pons A., Riquier L., Teissedre P.-L., Thibon C., Lytra G., Tempère S., & Barbe J.-C. (2020). Sensory characterisation of Bordeaux red wines produced without added sulfites. OENO One, 54(4), 733-743. https://doi.org/10.20870/oeno-one.2020.54.4.3794

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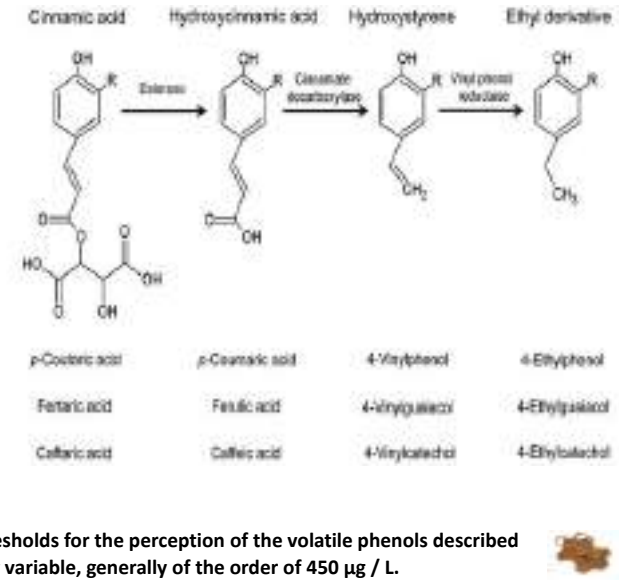
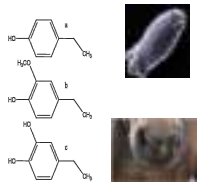
The formation of volatile phenols from their hydroxycinnamic acids precursors





4-ethyl-phenol (a) stable over time, with a stable odor, at the perception threshold of 400 µg / l in wine. In contaminated wines, there is generally 10 times more 4-ethyl-phenol than 4-ethyl-guaiacol.

4-ethyl-guaiacol (b) stable over time, with a clove odor, at the perception threshold of 100 µg / l in wine.

4-ethyl-catechol (c) smoky, camphoric.

The thresholds for the perception of the volatile phenols described are very variable, generally of the order of 450 µg / L.

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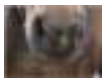
wine post-bottling development



Incidence of faults in wine during the International Wine Challenge

Description	2006	2008
Total faults, %	7.1	5.9
Cork taint	27.8	31.1
Oxidation related fault	34.3	19.1
Reduction related fault	29.2	28.9

Brettanomyces (11% in 2006, 16% in 2008)

IWC Observatory tracks faults through 14,000–15,000 bottles over the course of the annual 2 weeks of wines judging.

The occurrence of sulfide-like-odours related with screw-caps is increasing:

- in 2006, 2.6% of screw-caps represented 4.9% of reduction faults
- in 2007, 2.6% of screw-caps represented 7.3% of reduction faults

Goode J, Harrop S (2008) Wine faults and their prevalence: datafrom the world's largest blind tasting, in 16èmes Entretiens Scientifiques Lallemand, Horsens

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JAMIE GOODE COMMENTS IWC (MAY 28, 2019)

Default perceived by retro-olfaction (after mix with saliva)

'With the natural wine movement's growth, we have seen the corresponding growth of a rare wine fault'

But along with the natural wine movement's growth, we have seen the corresponding growth of a rare wine fault that previously students of wine learned about from textbooks, but rarely encountered: mousiness.

Mousiness seems to occur almost randomly in wines that haven't had any SO2 added. It is still quite a mysterious fault, and it's unusual among wine faults that you can't smell it until the wine is in your mouth. On your first encounter with a mousy wine, it tastes fine, as you take a sniff. Then you put it in your mouth and, after a few seconds, the characteristic flavour appears: mouse cage, water biscuits, and a sort of savoury warmth that's quite hard to describe.

It's kind of sickly sweet, and while it's not as repellent as the mustiness of cork taint, it's the sort of thing that stops you enjoying the wine. Some of the other descriptors associated with mouse include popcorn, rice, crackers, bread crust, sausage skin and vomit.

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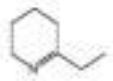
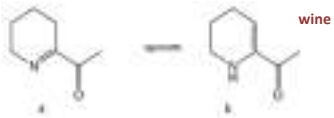
Mousy off-flavor ➢ 3 *N*-heterocyclic bases (other compounds?)

ETHP



2-éthyl-3,4,5,6-tétrahydropyridine

ATHP

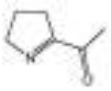


saliva

wine

2-acetyl-3,4,5,6-tétrahydropyridine ⟺ 2-acetyl-1,4,5,6-tétrahydropyridine

APY



2-acétyl-1-pyrroline

Mousy off-flavor is produced by different microorganisms

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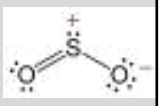
Dioxyde de Soufre



- **Inhibits / kills native yeasts and bacteria**
- **Inhibits oxidative enzymes responsible for browning, and delays enzymatic browning**
- **Bleaches anthocyanin pigments**
- **Interacts with phenols in competitive oxidation**
- **Prevents the development of deteriorating bacteria and yeasts (Acetobacter, Lactobacillus, Pediococcus, Brettanomyces, etc.), and participates in the selection of yeast and bacteria species for fermentations**

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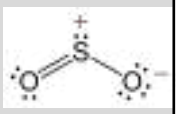
Sulphur dioxide



- **Prevents oxidation of wine (preservation of aromas and color during storage)**
- **Allows to obtain more shelf life for wine storage (transport, sale, ...)**
- **The biocidal power of sulfur dioxide, while useful, is not always sufficient to ensure an aseptic product.**
- **-The main function of sulfur dioxide in finished wines is to bind to carbonyl compounds, in particular acetaldehyde, to avoid any sensory symptoms of "oxidation".**

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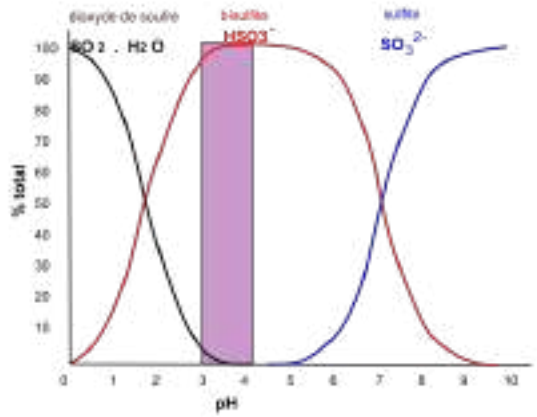
SO2 dissociation



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Risks if insufficient protection in SO_2

General Series of Chemical Oxidation

R = alkyl or aryl group

RH2OH → RHO → RCOOH

Alcohol — Aldehyde — Acid

CH3OH → CHO → HCOOH

Methanol — Formaldehyde (Methanal) — Formic Acid (Methanoic Acid)

C2H5OH → CH3CHO → CH3COOH

Ethanol — Acetaldehyde (Ethanal) — Acetic Acid (Ethanoic acid)

Threshold in wine: 100-125 mg/L

Oxidized-brown apple, Withered apple

Vinegar, pungent

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Esterification in Wine

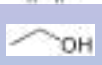
Alcohol	Acid	Ester	Aroma Descriptors
Ethanol	Acetic Acid	Ethyl Acetate	nail polish remover
Ethanol	Lactic Acid	Ethyl Lactate	creamy, buttery, coconut
Ethanol	Formic Acid	Ethyl Formate	rum, raspberry
Ethanol	Butyric Acid	Ethyl Butyrate	banana, pineapple, strawberry
Isoamyl Alcohol	Acetic Acid	Isoamyl acetate	pear, banana

Actic Acid

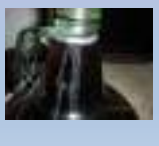
At wine pH

Acetate Ion

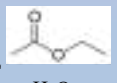
Ethanol



Ethyl Acetate



Acescent character more than 120 mg / L Ethyl acetate



+ H_2O

Nail polish remover, acetone

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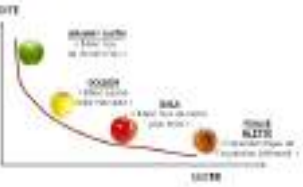
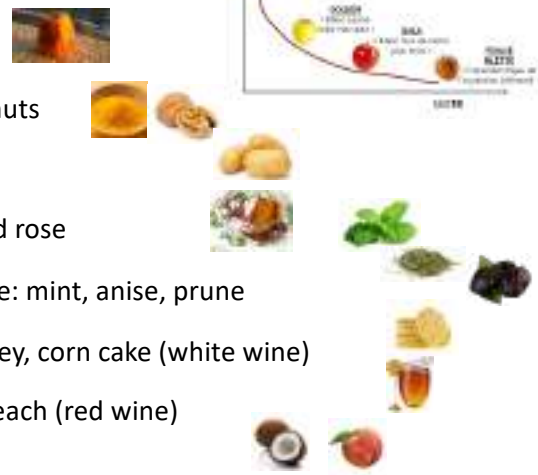
Markers of early oxidation



- ✓ Ethanal: mashed apple
- ✓ Sotolon: curry, rancid walnuts
- ✓ Méthional: baked potato
- ✓ Phenylacetaldehyde: faded rose
- ✓ 3-Methyl-2,4-Nonanedione: mint, anise, prune
- ✓ Aminoacetophenone: honey, corn cake (white wine)
- ✓ γNonalactone: coconut, peach (red wine)



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The true value : active SO_2

Free SO_2 mg/l
Lab measurement

Active SO2 Actif:
H_2SO_3
1 to 10 % depending on the pH
Low pH ↗ activity
T° C ↗ activity ↗
The most efficient

90 to 99 % HSO_3^-
Less efficient fraction with respect to microorganisms

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Value of Active SO_2

Fongistatic action

For a minimal protection (fungistatic action) target → 0,35 mg/L of Active SO_2

Fungicidal action

For a minimal protection (fungicidal action) target → 0,60 mg/L of Active SO_2

Dependance on Free SO_2 level , pH=3,01, Alcoholic strength, Temperature

Active SO_2 calculator on websites

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Reflexions

- Natural wine could be assimilate to a particular case of EU organic wine (OIV Working Group reflexion)
- 7% of Faults current on panel classical/traditional wines samples that can become 70% for wines produced without SO_2 protection.
- Risks to have a trivialization of organoleptic defects elevated to quality rank
- The question for winemakers in a near future is :

-How to protect wine from oxidation process ?

-How to protect wine from microbiological development ?

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IMPORTANCE OF SO_2 AND ACIDITY OF WINE – NEEDS FOR ALTERNATIVES

2020

OIV COLLECTIVE EXPERTISE

SO_2 AND WINE: A REVIEW

Coordinator
International Organisation of Vine and Wine (OIV)

Authors
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Ing. Claudia Quini (Argentina)

The production of wines with reduction of SO_2 concentrations need to be explored and should be managed with recommendations at all steps of the winemaking process – from the grapes to the bottle – without compromising wine quality in terms of organoleptic characteristics and microbiological stability.

This approach should be considered in function of the various wines types specifities and taking into account the OIV Code of good practices that recommends different practices to limit the use of SO2 in wine making process.

Based on data received from several Member States the mean concentration of total SO2 observed according to the different types of wine are :

Red < 4g/L sugars: 60-96 mg/L
White/Rosé < 4g/L sugars: 100-132 mg/L
Red/White/Rosé > 4g/L sugars: 80-130 mg/L
Sweet/Special wines: 110-180 mg/L

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Reflexions

→ `Future alternatives :

Physical or biological and chemical treatments to explore with 2 functionalities:

→ **Inhibit / Kill yeasts and bacteria**
→ **Prevent oxidation of wine (preservation of aromas and color during storage) to avoid negative sensory consequences.**

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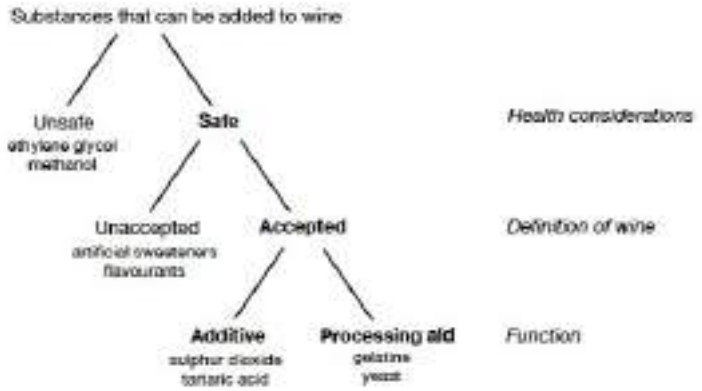
Additives for organic wines (EU)

A classification of substances that can be added to wine



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Additives for organic wines (EU)

A list of permitted additive products and substances.

-All those of natural origin (plant, provided they are non-GM; mineral; microbiological) are allowed.

-Potentially dangerous, non essential and synthetic additives are forbidden or, if no alternative exits, restricted.

-As mentioned there are many substances allowed in conventional wine which are not allowed for organic

-Preference should be given to the use of additives and processing aids derived from organic raw materials

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Additives for organic wines (EU)

Products and substances authorised for use or addition in organic products of the wine sector referred to in Article 29c

Type of treatment in accordance with Annex I A to Regulation (EC) No 606/2009	Name of products or substances	Specific conditions, restrictions within the limits and conditions set out in Regulation (EC) No 1234/2007 and Regulation (EC) No 606/2009
Point 1: Use for aeration or oxygenation	— Air — Gaseous oxygen	
Point 3: Centrifuging and filtration	— Perlite — Cellulose — Diatomaceous earth	Use only as an inert filtering agent
Point 4: Use in order to create an inert atmosphere and to handle the product shielded from the air	— Nitrogen — Carbon dioxide — Argon	
Points 5, 15 and 21: Use	— Yeasts (¹)	
Point 6: Use	— Diammonium phosphate — Thiamine hydrochloride	
Point 7: Use	— Sulphur dioxide — Potassium bisulphite or potassium metabisulphite	(a) The maximum sulphur dioxide content shall not exceed 100 milligrams per litre for red wines as referred to in point 1(a) of Part A of Annex I B to Regulation (EC) No 606/2009 and with a residual sugar level lower than 2 grams per litre; (b) The maximum sulphur dioxide content shall not exceed 150 milligrams per litre for white and rosé wines as referred to in point 1(b) of Part A of Annex I B to Regulation (EC) No 606/2009 and with a residual sugar level lower than 2 grams per litre; (c) for all other wines, the maximum sulphur dioxide content applied in accordance with Annex I B to Regulation (EC) No 606/2009 on 1 August 2010, shall be reduced by 30 milligrams per litre.
Point 9: Use	— Charcoal for oenological use	
Point 10: Clarification	— Edible gelatine (²) — Plant proteins from wheat or peas (²) — Isinglass (²) — Egg white albumin (²) — Tannins (²)	
	— Casein — Potassium caseinate — Silicon dioxide — Bentonite — Pectolytic enzymes	

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Additives and Processing Aids for organic wines (EU)

Type of treatment in accordance with Annex I A to Regulation (EC) No 606/2009	Name of products or substances	Specific conditions, restrictions within the limits and conditions set out in Regulation (EC) No 1234/2007 and Regulation (EC) No 606/2009
Point 12: Use for acidification purposes	— Lactic acid — L(+)Tartaric acid	
Point 13: Use for deacidification purposes	— L(+)Tartaric acid — Calcium carbonate — Neutral potassium tartrate — Potassium bicarbonate	
Point 14: Addition	— Aleppo pine resin	
Point 17: Use	— Lactic bacteria	
Point 19: Addition	— L-Ascorbic acid	
Point 22: Use for bubbling	— Nitrogen	
Point 23: Addition	— Carbon dioxide	
Point 24: Addition for wine stabilisation purposes	— Citric acid	
Point 25: Addition	— Tannins (²)	
Point 27: Addition	— Meta-tartaric acid	
Point 28: Use	— Acacia gum (²) (= gum arabic)	
Point 30: Use	— Potassium bitartrate	
Point 31: Use	— Cupric citrate	
Point 31: Use	— Copper sulphate	Authorised until 31 July 2015
Point 38: Use	— Oak chips	
Point 39: Use	— Potassium alginate	
Type of treatment in accordance with Annex III, point A(2)(b) to Regulation (EC) No 606/2009	— Calcium sulphate	Only for "vino generoso" or "vino generoso de licor"

(¹) For the individual yeast strains: if available, derived from organic raw material.
(²) Derived from organic raw material if available.

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Additives and Processing Aids for organic wines (EU)

Non-exhaustive list of substances forbidden in production of organic wines

Permitted ingredients including concentrated must, concentrated rectified must, sucrose and yeast cells must all be organic

Product	Application
Concentrated must	Enrichment
Concentrated rectified must	Enrichment
Sucrose	Enrichment
Yeast cells	Fermentation management, yeast nutrition
Active dry yeast, fresh yeast suspension	Yeast addition
Edible gelatine	Fining
Plant proteins from wheat or peas	
Isinglass	
Egg white albumin	
Tannins	
Acacia gum (gum arabic)	Tartaric and colour stabilisation
Tannins	Addition of tannins

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Problems with additives and technologies not allowed in organic

- Following publication of the new regulation in 2012, some wineries which had been producing natural and organic wines for many years discovered that some of their practices did not meet with the new organic standards.
- For example, it has been problematic for some wineries that yeasts may be fed with phosphates but not sulphates.
- In other cases, the new regulation has been criticised for forbidding substances such as lysozyme and sorbic acid which many consider to be natural and which can help reduce the wine's sulphite content (particularly important for organic wine).

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Oenological Practices for organic wines (EU)

Oenological practices not suitable for organic production

-Partial concentration through cooling
-Elimination of sulphur dioxide by physical processes
-Electrodialysis treatment to ensure the tartaric stabilisation of the wine
-Partial dealcoholisation of wine
-Treatment with cation exchangers to ensure the tartaric stabilisation of the wine
-All new physical methods allowed in regulation (EC) No 144/2013 like nano- or ultrafiltration as well as coupled membrane procedures.
-In heat treatments the temperature shall not exceed 70°C and the size of the pores for centrifuging and filtration shall not be smaller than 0.2 µm.

Some questions are still open about use of heat treatments, use of ion exchange resins for rectification of concentrated must and reverse osmosis. These are currently allowed in organic wine production but shall be re-examined by the European Commission before 1st August 2015 with the aim of verifying if they can be phased out or further restricted

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Labeling for organic wines (EU)

	Produced before 1st August 2012	Produced after 1st August 2012
Production methods meet requirements of new legislation	 **"Organic wine"** For wines produced before 1st August 2012, producers must provide documentary evidence of compliance with new rules	
Production methods do not meet requirements of new legislation	**"Wine made from organic grapes" [no logo permitted]** Wine produced before 1st August 2012 that have not been produced according to the new rules or for which there is not sufficient evidence to prove it.	**Conventional wines** No reference to organic possible

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COPPER use

- Another important substance is copper, which is used to reject plant diseases**. The allowed amount of copper is 4 kilograms per hectare in a year.**
- Although this is only a fraction of what is used in conventional viticulture, organic farming research attempts to find functional alternatives.
- As a report published by Efsa (European Food Safety Authority), pointed to a number **of environmental hazards with copper spray. Efsa mentions the danger to earthworms, bees, birds and aquatic organisms.**

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COPPER use

- Since the 1800s, vintners have combated downy mildew with a copper solution called bouillie bordelaise. Otherwise known as Bordeaux mixture, the solution contains a mix of copper sulfate, lime, and water. While allowed in organic viticulture, prolonged use of high concentrations of Bordeaux mixture (and other copper-based solutions) can be extremely harmful to vineyards.
- “Copper can leave heavy metals on the surface of the soil, which can not be metabolized by microorganisms”. **When copper accumulates, it affects the concentration of useful microorganisms, the pH of the soil, and ultimately grapevine growth.**
- The issue can be further compounded by non-organic producers who use copper alongside chemical herbicides, a combination that can be toxic for soils.

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Risks of contamination

- **The risk of contamination with pesticides and nitrate are assumed to be lower in organic food than in conventionally produced food.**
- Nevertheless,undesirable additives such as mycotoxin, heavy metal and PCB contents, or desirable substances such as vitamins, nutrients or aromatic compounds cannot be found in significant levels in organic products, which demonstrates the difference between organic and conventional farming.

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New EU legislation from 2022

- **New organic legislation will enter into force on January 2022. The rules will reflect the changing nature of this rapidly growing sector. The new regulation is designed to ensure fair competition for farmers whilst preventing fraud and maintaining consumer trust through he following:**
- **production rules will be simplified through the phasing out of a number of exceptions and opt outs;**
- **the control system will be strengthened thanks to tighter precautionary measures and robust checks along the entire supply chain;**
- **producers in third countries will have to comply with the same set of rules as those producing in the EU;**

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New EU legislation from 2022

- organic rules will cover a wider list of products (e.g. salt, cork, beeswax, maté, vine leaves, palm hearts) and will have additional production rules (e.g. deer, rabbits and poultry);
- certification will be easier for small farmers thanks to a new system of group certification;
- there will be a more uniform approach to reducing the risk of accidental contamination from pesticides;
- exemptions for production in demarcated beds in greenhouses will be phased out.

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