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Organic viticulture facing climate change

New challenges in organic wine production and marketing

Hochschule Geisenheim University

9 November 2020

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Organic viticulture facing climate change

New challenges in organic wine production and marketing

9th November 2020
Hochschule Geisenheim University (HGU)
Von-Lade-Str. 1, 65366 Geisenheim, Germany

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OENOBIO: A STRATEGIC PARTNERSHIP FOR VINES AND WINES ORGANIC PRODUCTION, GOALS AND IMPLEMENTATIONS

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Abstract

Strategic Partnership OENOBIO consists in a Consortium: University of Bordeaux, Hochschule Geisenheim University, USAMV Bucuresti, Universitat Rovira i Virgili, Universita di Torino, Syndicat des Vignerons Bios d'Aquitaine and ECOVIN. With increasing awareness of environmental sustainability, health benefits and the need to reduce reliance on chemical inputs in viticulture, grape growers, winemakers and consumers have become the driving force behind the growth in organic grape and wine production. However, supporting research and educational programs have not kept pace with this increased industry and consumer interest at a coordinated European level. Specializing viticulture and oenology students in this field, with an approach that brings together key educational and industry partners from across Europe is therefore a priority. It is notable that the organic vineyards have exhibited far higher growth rates than the overall organic farmland. In this context, we have established the following main goals in order to address this necessity:

1) Developing an Intensive Study Programme (ISP) dealing with organic viticulture and wine fields
2) Creating a Learning Management System (LMS) for ISP Master students
3) Building a mutualized Master pathway programme between the OENOBIO consortium partners by using the LMS
4) Progressively opening the ISP and LMS to the socio-professional sector to support Life Long Learning

During the last decades, there has been an increasing demand for organic and inherently 'green' wine products. Also, over the past few years, the EU has been developing codes of good practices for organic viticulture and winemaking, focusing on the development of environment and consumer friendly technologies for organic wine quality improvement and scientifically based legislative frameworks. The demand of knowledge in Europe regarding organic vine and wine production is now also originating from the industry and the needs of specialization of oenologists' students in this field has therefore become a necessity. To respond to this demand, the five partner universities have decided to collaborate in this context by sharing their experiences and teaching contents focusing on organic vine and wine production. Our harmonized European programme in organic vine and wine production is innovative with the COVID-19 situation. In this context, the five partners had initially decided to build an Intensive Study Programme offering specific courses for advanced Bachelor/Master/PhD students in the field of view to their future professional activities. Our project will also offer the students a new educational and pedagogical tool: a "Learning Management System" (LMS). This is an e-learning collaborative platform for exchanges between teachers and students with distancing teaching. Teachers will be able to do synchronous or asynchronous teaching classes and submit

files, videos and links to websites in order to complete the courses. The activities, available on the working tool, are designed to create an interaction between teachers, students and professionals. It will also be used as a discussion forum, to submit comprehension tests or evaluations, to hand in papers, or to organize activities for collaborative work. This new way of open and flexible learning, providing training and support to the students, will increase the virtual mobility and develop the educational resources in the ICT field.

EU ACTIONS TO SUPPORT ORGANIC WINE

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Abstract

Organic viticulture and organic wine continue their dynamic growth of surfaces and consumption. Several EU actions have and will contribute to support and reinforce this growth. In defining what is organic and what is not, the EU organic legislation ensure a level-playing field between operators, fair competition and improved profitability. The current Rural Development Programmes provides financial support for active farmers for conversion to, and maintenance of, organic farming practices. Supply and demand, production and consumption, must grow together to maintain the profitability of the sector. The EU Promotion policy co-finances promotion programmes to increase consumption and gain new markets. EU research and innovation contribute actively to the dynamism of the organic sector. The wine growers can benefit from advice on best practice or on how to adopt new and innovative solutions.

Through the Farm to Fork and the Biodiversity strategies, published in May 2020, the Commission has committed to reach at least 25% of the EU's agricultural land under organic farming by 2030. To meet this target, the Commission proposed setting up an action plan to accompany the sector in this route, helping Member States to stimulate both supply and demand for organic products and to ensure consumer trust. A comprehensive consultation strategy is carried out from the 4th of September until the 27th of November 2020 to collect and analyse the opinion and the ideas of all stakeholders on actions to be developed.

Keywords: EU organic legislation, EU supports for wine-growers

VITICULTURE UNDER CHANGING CLIMATIC CONDITIONS: AN EQUATION WITH (TOO) MANY VARIABLES?

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Abstract

To evaluate the current and future impact of climate change on viticulture requires an integrated view on a complex interacting system within the soil-plant-atmospheric continuum under continuous change. For example looking at the soil, we observe rising temperatures in the upper soil layers, which will have an impact on the distribution of microbial populations, the decay rate of organic matter and the viscosity of water in the soil-plant pathway, affecting the transport of water. Depending on the plant material (rootstock for instance), and its anatomical "make-up", the effects may be quite different between genotypes. Depending on organic matter content, the vast majority of carbon and a significant amount of nitrogen stored in a vineyard is in the upper soil layers with the rest being stored in roots and woody organs of the vines. It is therefore decisive how soil and organic material, can be managed to minimize greenhouse gas (GHG) emissions (especially CO_2, nitrous oxide, N_2O), respectively turning vineyard soils into GHG sinks instead of sources. This is one of the key questions when looking at organic, biodynamic or conventional cultivation systems and the challenge to develop **the most optimal** system with respect to environmental impact, economic and social sustainability. The response of the "system" also depends on the distribution and strength of precipitation events and site factors such as slope and soil type and depth and many cultivation variables, which makes an integrated assessment extremely difficult.

Keywords: soil temperature, rising carbon dioxide (CO_2), organic material, water transport, management options

COULD ORGANIC VITICULTURE MITIGATE EFFECTS OF CLIMATE CHANGE?

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Abstract

Climate change and agriculture are closely linked, since 21 % of the global greenhouse gas emissions (CO_2 equivalents) can be attributed to agricultural land use, crop production, and livestock and fisheries. There are three different types of greenhouse gas emissions in agriculture: direct CO_2 emissions, e.g. exhaust gases of agricultural machinery, indirect CO_2 emissions, e.g. CO_2 emissions resulting from the production of pesticides, and soil derived greenhouse gas emissions. Few studies exist elucidating the contribution of different viticultural management systems to direct and indirect CO_2 emissions as well as to soil derived greenhouse gas emissions. In an agricultural long-term field trial comparing conventional, organic, and biodynamic management in Switzerland the systems were evaluated regarding their energy and nutrient inputs, and their soil derived greenhouse gas emissions. Referring to these results we hypothesize that organic viticulture could reduce inputs and thus indirect CO_2 emissions by not using herbicides, mineral fertilizers, and synthetic spray agents. Organic viticulture is expected to use slightly higher amounts of fuel compared to conventional or integrated systems, but is on the other hand supposed to significantly reduce gas emissions from the soil.

Concerning the effects of elevated CO_2 on grapevines, vigor (leaf biomass and lateral leaf area), yield, single berry weight, and bunch weight of grapevines (cv. Riesling and Cabernet Sauvignon) have been shown to increase with increasing atmospheric CO_2 in the VineyardFACE in Geisenheim. Organic viticulture, in contrast, showed significantly lower yields, lower vigor, and lower bunch weights in the long-term field trial (cv. Riesling) comparing different management systems in Geisenheim. This is why we hypothesize that organic viticulture could mitigate effects of elevated CO_2 on grapevine growth, yield, and bunch weight, and could thus be one possibility to face climate change.

Keywords: organic, climate change, greenhouse gas emissions, carbon dioxide (CO_2), growth, vigor

FACING CHANGES IN VITICULTURE – EXPERIENCE OF A WINERY. ESTATE ALOIS LAGEDER - ALTO ADIGE

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Abstract

Climate change can be seen as a threat as well as a new chance. Therefore it is important, that we adapt ourselves to it as good as possible and try to coexist as well as to reduce our negative impact. There are many ways in doing that. Experience of a winery in a discussion with Alois Clemens Lageder on practical possibilities and ideas.

ACT NOW! THE ECOVIN BIODIVERSITY ACTION PLAN AS ONE POSSIBLE ANSWER TO CLIMATE CRISIS AND BIODIVERSITY CRISIS

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Abstract

The Intergovernmental Panel on Climate Change (IPCC) is a platform that the World Association of Metereologists and the United Nations founded in 1988. According to the current (fifth) assessment report (2013), the climatic conditions in large parts of the world will change even faster and more dramatically than previously assumed. This will lead to major changes in the wine industry, which will affect adaptation strategies, water management, variety selection and biodiversity.

The advancement of Europe's wine-growing regions to the north is an effect of climate change. In Denmark and Sweden, for example, viticulture is practiced today. In Germany, the grape variety Merlot is no longer exotic. The few advantages of climate change for viticulture (more hours of sunshine, more CO_2 content, higher grape ripeness and more aroma / color formation) contrasts with a significantly longer negative list.

The loss of biodiversity is a major negative factor here. In addition to the climate crisis, the biodiversity crisis is at least as challenging. Political decision-makers are now also aware of this problem. The European Green Deal, with its ambitious goal of reducing greenhouse gas emissions to zero by 2050 and thus becoming the first continent to become climate-neutral, or the European Union's Farm to Fork Strategy will hopefully also contribute achieving the United Nations' Sustainable Development Goals (SDG).

In 2019, ECOVIN, the Federal Association of Organic Viticulture in Germany, integrated the Biodiversity Action Plan (BAP) into its guideline. Therefore, selected examples are shown to demonstrate which adjusting possibilities have been identified in the wine industry to decrease the biodiversity crisis.

CLIMATE EVOLUTION AND TRENDS IN SOUTHERN ROMANIA AND IMPLICATIONS FOR VINE GROWING AND WINEMAKING

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Abstract

Grapevine is extremely sensitive to climate changes, therefore it is of great importance to follow the climate trends, in order to find solutions and adapt in due time. Long-term studies are valuable for the adaptation of vine management practices and winemaking interventions. This study aimed to characterize the climate warming in the area of Bucharest, which is representative for the temperate continental climate of Southern Romania. The study covers 14 climatic parameters and 3 bioclimatic indices important for vine growing (Huglin, Winkler and Cool Night Index) over 57 years, from 1961 to 2018. Trends were evaluated by taking into account the entire period, as well as by comparing the "present-time period", covering 21 recent years (1998-2018) with the "reference period" of previous 36 years (1961-1997). The meteorological data were recorded by Bucharest-Baneasa station (44°43'N; 26°10'E). The observations in the vineyard of University of Agronomic Sciences and Veterinary Medicine of Bucharest, on the Fetească regală variety clone 21 Bl planted in 1994, cover the present-time period of 21 years (1998-2018). Comparing the present period with the reference period significant changes were observed: the average maximum temperature increased by 1.89ºC during summer period and by 1.99ºC in the warmest month, the average temperatures in the viticulture growing season increased by 0.75°C, the minimum temperature of the growing season increased by 0.41°C, the average of absolute minimum temperature decreased by 2.89°C and the absolute minimum temperature decreased by 2.0ºC. The frequency of years with minimum temperatures below -20°C, harmful for vine, increased too in the present period (10 out of 21 years) as compared to the previous period (7 out of 36 years). The most significant changes for vine growing occurred during summer months (June-August), which show a difference of +1.21°C between the average temperatures of the two compared periods. The number of hot days (T>30°C) and very hot days (T>35°C) showed a clear increase. Annual precipitations and rainfall during the summer months had less significant changes. The bioclimatic indices of Huglin and Winkler clearly increased, while the Cool Night Index was less affected. Especially, the evolution of Huglin index between 1977 and 2018 suggests a shift of the region's climate from warm temperate (class IH +1) to warm climate (class IH +2). For several climate-related parameters the evolution was assessed by linear regression and Pearson correlation index (r). These calculations support the observation that, overall, temperature is increasing with time, even if the linear regression equations explain only partly the variance, meaning that the phenomenon is not entirely linear, but has many fluctuations. The behavior of Fetească regală variety in the studied period (1998-2018) was also influenced by year to year fluctuations. The yield varied from 1.8 to 4.8 kg of grapes/vine, due to the variable incidence of minimum harmful temperatures recorded in winter. Precipitations during the summer increased the berry weight and total titratable acidity. Years with Huglin index less than 2400 units (warm temperate climate) produce wines more typical for Fetească regală variety, as the total titratable acidity is generally over 6.0 g/l tartaric acid while sugar accumulation is generally lower than 22 Brix, leading to harmonious light-bodied wines, with less than 13% vol. alcohol. When Huglin index values rise above 2400 units acidity corrections are required and the concentration of above 13.5% vol. alcohol obtained makes the wines of this variety less

balanced. The following 6 climate parameters collected during a growing season were proven to have the most effect on grape quality: precipitations (mm); average temperature in the warmest month (ºC); maximum temperature in the warmest month (ºC); number of days with T>30ºC; number of days with T>35ºC; Huglin Index. These 6 parameters were shown by a multiple regression correlation to explain 56% of the variance for the sugar accumulation (Brix) and 74% of the variance for the total titratable acidity.

(The results are published in Bucur *et al*., 2019, The climate change influences and trends on the grapevine growing in Southern Romania: A long-term study, BIO Web of Conferences 15, 01008, 2019 https://doi.org/10.1051/bioconf/20191501008)

Keywords: climate change, climatic indices, viticulture, Feteasca regala grape variety, Romania

FIELD REPORT ON THE 2020 HARVEST: ADAPTATIONS OF ORGANIC PRACTICES IN BORDEAUX, FRANCE

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Abstract

Is climate change already there in Bordeaux region? The 2020 vintage seems to prove it. These last years, we saw more dangerous frost and hail events because of the acceleration of vine cycle. Winegrowers must adapt to protect their vineyard. As a matter of fact, the adaptation of vineyard management to find back good yield is a key point.

Concerning plant protection, spring shows more and more heavy rain periods as in 2018 and 2020. Nevertheless, we saw this year, a very good adaptation of winegrowers to fight against downy mildew: especially organic producers. Compared to 2018, there were less fails even though the season was harder. Organic consultants play also a key role to make winegrowers to evolve their copper use and improve their spreading.

Then, summers are more and more dry. We notice an increase of technologic maturity with a strong rise of alcoholic degree, due to regular dry periods. Insect impact as Eudemis (*Lobesia botrana*) and Cochylis (*Eupoecilia ambiguella*), accentuate the problem and force producers to adapt their plant protection strategies. Indeed, their generations are more and more important and their presence last longer during the season.

At the same time, phenolic maturity is blocked and berries microbiology evolves under these conditions. This is particularly true especially during harvest, when winegrowers wait for better skin maturity or wait for rains to decrease alcoholic degrees.

These context push winemakers to adapt harvest dates and their vinification process.

Keywords: climate change, viticulture, oenology, organic, harvest, Bordeaux

STRATEGIES OF ORGANIC SPARKLING WINE PRODUCTION UNDER CHANGING CLIMATIC CONDITIONS

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Abstract

The winemaking of sparkling wines faces a big challenge under the climate change. Global warming has as consequence the advancing of the harvest date, shorting the ripening time, and producing base wines with higher contents of alcohol, higher pH and low acidity. Major solutions could be moving the vineyard to colder terroirs in northern territories as England were nowadays sparkling wine producers increasing or vineyards were planted at higher altitudes. There are several solutions from the point of view of the winemaker to adapt the process to the requirements to produce quality sparkling wine in the frame of organic production. The permitted additives that could be used will be listed and a strategy to produce sparkling wines without sulfites using the ancestral (or rural) method is one of the solutions. It allows by pressing whole grapes, and avoiding the grape juice to settle to remove the turbidity and use the richest fraction in acids to produce sparkling wine. These techniques will be discussed focusing in their advantages to the production of quality organic wines.

Keywords: ancestral method, cation exchange, press, climate change

THE CHALLENGE OF SULPHITE CONTENT REDUCTION IN ORGANIC WINES: POSSIBLE STRATEGIES FOR RED WINEMAKING

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Abstract

Sulfur dioxide (SO_2) is the most common preservative used in wine industry because of its antimicrobial, antioxidasic, and antioxidant properties. Nevertheless, SO_2 is related to adverse reactions in sensitive individuals and, more in general, to human health concerns for its possible excessive intake. Moreover, the wine market demands for more "natural" products and therefore its reduction is required in winemaking practices.

The possibility to reduce sulfite contents in wines, particularly for organic wine production, can be approached by appropriate cellar practices, but sometimes the technological strategy alone is not adequate to fulfill winemakers' demands. The available alternatives to sulfur dioxide can be summarized in two categories: substitutes processing aids and physical methods. Rarely, one option alone can be suitable to achieve both microbial stabilization and antioxidant effect. The state-of-the-art of the possible alternatives to SO_2 will be discussed, taking in consideration the allowed practices and promising applications in organic wine production.

Harvesting and maintaining grapes in good conditions, together with a good phytosanitary status, remain the first key factor towards a rational use of SO_2. Nevertheless, this aspect is not always possible, therefore innovative strategies in post-harvest red grapes sanitization will be discussed as SO_2 alternatives for their antimicrobial properties. In particular, the use of ozone (gaseous or liquid form, as ozonized water) and electrolyzed water treatments on grapes have been investigated in order to understand their efficiency and suitability in winemaking conditions.

Keywords: sulfur dioxide (SO_2), organic winemaking, sulfite alternatives, ozone

NATURAL WINE AND ORGANIC WINE PRODUCTION: MANAGEMENT AND RISKS IN THE FRAME OF CLIMATE CHANGE

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Abstract

The increase in the supply of so-called natural wines, a niche market that is close to 2% of the current French wine production, responds to a search for authenticity and a health promise, essentially through the reduction of inputs, particularly sulphites. This expectation seems legitimate and must be taken into account. However, in the frame of climate changes there is a major risk in decreasing acidity and increasing alcohol levels of wines. Mastery of processes and knowledge of microbiological phenomena have, for example, enabled oenologists for several decades to substantially reduce doses of sulfur dioxide used. Thus, the doses of total authorized sulphites could be discussed. However, 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 uncontrolled fermentation, or to technical failure, are numerous and can reappear:

- The mousy taint generated by strains of yeast of the *Brettanomyces* type and of certain *Lactobacillus*;
- The change of microbial origin, in which lactic acid bacteria degrade tartaric acid to give wines without acidity but rich in CO_2;
- Bitterness caused by a bacterial attack on glycerol to give acrolein (toxic);
- Lactic acid bacteria of the genus *Pediococcus* producing glucans which gives wines an oily texture.
- Ethyl acetate produced by oxidative yeasts and to a lesser extent by those used in wine making;
- In addition, ethanal is produced by yeasts (nutritional deficiencies in particular promote their formation) during alcoholic fermentation and by oxidation during ageing. It is toxic at high concentration and must be controlled, and SO_2 in this case remains an essential ally with the technical mastery of the moment of its addition.

For these reasons management of natural wine in comparison with organic wine and conventional wine production needs to be considered specifically in order to guarantee quality for the consumers. Levels of sulfur dioxide or possible antioxidant alternatives should be deeply studied in order to offer the best winemaking and ageing processes for future possible definition of natural wines in particular.

Keywords: natural wine, organic wine, conventional wine , sulfur dioxide and alternatives, climate changes, definition

CONSUMER PREFERENCES: TRENDS AND REASONS BUYING ORGANIC SPARKLING WINES

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Abstract

In the first part, we will analyze through several studies the trends in the consumption of organic wine in pandemic worldwide. The focus will be especially on the potential, opinion and purchase motivations according to age of the different consumers in this category.

In a second part, we will study more specifically thanks to a qualitative survey carried out in Barcelona with regular consumers of organic cava the following items: occasions of consumption, habitual channels of purchase, decisive factors in the purchase and various analysis of perceptions. Finally we will focus on the concept of "value ready to pay" according to the different consumer groups and always comparing conventional with organic cava categories.

In the last part, we will see several examples of the application of these conclusions in the international marketing strategy of a range of organic sparkling wines.

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