



# 2<sup>nd</sup> Science & Wine World Congress

June 2-3, 2021



# Presentation

The congress “2nd Science & Wine World Congress. Wine and Olive Oil Production: The Fluid Aspect of Mediterranean Diet” happened at 2 to 3 June 2021. In view of the pandemic situation caused by COVID-19 it was an online meeting. The program allowed to discuss the more recent achievement in the research field regarding wine and olive oil production and their importance on the Mediterranean Diet.

## **Track 1: Advances in Mediterranean diet research**

- Managing Big Data and Technology
- Biochemical and Molecular Advances
- Monitoring and Evaluation of Nutrition and Food Security
- Models for the Industry of the Future

## **Track 2: Nutrition, health and lifestyle**

- Nutrition and Health
- Nutritional Epidemiology
- Nutricosmetics
- Prebiotic and Probiotics
- Geriatric Nutrition
- Sports Nutrition
- Nutritional Therapy and Treatments
- Nutrigenetics, Nutrigenomics, Epigenetics & Pharmacogenetics
- Multi-omics Approaches
- Personalised Nutrition & Personalised Medicine
- Diet and the Gut microbiome
- Translational Aspects and the Future of Medicine

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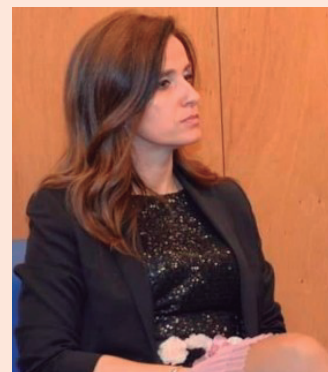




# Invited Speakers



# NIR and MIR Infrared: The Spectroscopic technique for the traceability and authentication of olive oils and wines



Irene Gouvinhas<sup>1</sup>, Ana Novo Barros<sup>1</sup>

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Some spectroscopical techniques have been extensively explored for the assessment of contents of various food matrices. Among these, vibrational techniques, such as IR, generally Fourier Transform-IR (FTIR), and Raman, have emerged recently as analytical methods widely used for food and feed analysis [1].

Actually, the conventional measurements employed in the assessment of the chemical composition of foods, such as peroxide values, fatty acids, phenolic and volatile compounds, are time consuming and require large amounts of reagents and solvents, which are toxic and expensive. Furthermore, they require the pre-treatment of sample. On the other hand, spectroscopical means, such as FTIR —particularly when used in conjunction with Attenuated Total Reflectance (ATR), dismiss any kind of sample preparation, avoiding the occurrence of chemical transformations, such as oxidation [2,3]. Furthermore, while the ATR module works within the medium-IR range (MIR), there are other accessories available, such as Diffuse Reflectance Integrating Sphere-FT (DRIFT), which, besides also dismissing the sample preparation, register the samples' spectrum within the near- IR (NIR) range, thus retrieving supplementary information [4].

These vibrational spectroscopic methods provide information about the chemical composition of various food and biological materials, and molecular structure. In the last few years, our research group is focused in the implementation of IR spectroscopy, coupled to chemometric data analysis methods, for the authentication and traceability of olive oils and wines, supplying the use of classical methodologies, and in some cases, without even the destruction or opening the bottles.

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## Acknowledgements:

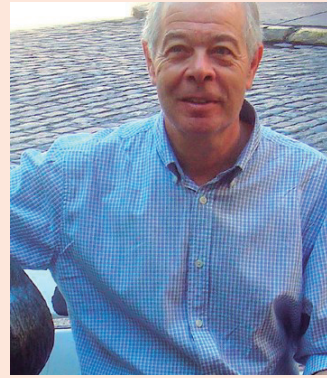
This work was funded by national funds from by FCT – Portuguese Foundation for Science and Technology, under the projects UIDB/04033/2020 and POCI-01-0145-FEDER-006958



# Wine, polyphenols and Mediterranean diet. What else is there to say?

**Celestino Santos-Buelga**

University of Salamanca, Spain



A lot of literature has been published claiming the cardiovascular benefits of moderate (red) wine drinking, which has been considered a trait of the Mediterranean diet. Indeed, red wine contains relevant amounts of polyphenols, especially flavonoids, for which evidences on their biological activity and beneficial health effects are abundant. Furthermore, ethanol itself may exert positive actions on the cardiovascular system by increasing HDL-cholesterol, preventing platelet aggregation and enhancing fibrinolysis. However, it is also well known that alcohol, especially when excessively or frivolously consumed, has severe consequences for health and serious social implications. Among others, it is directly related to a number of non-communicable diseases, like liver cirrhosis or diverse types of cancer. The International Agency for Research on Cancer (IARC) classifies alcohol as a Group 1 carcinogen, causally associated with the development of cancers of the upper digestive tract and liver, and with sufficient evidence to be positively associated with colorectum and female breast cancer. It is also to consider that the associations between wine consumption and cardiovascular health mostly rely on observational studies and indirect evidences obtained from in vitro and animal assays, but hardly studies exist to actually prove a causal relationship in humans. In these circumstances, it is tricky, if not irresponsible, to spread any message on the benefits of moderate wine drinking, about which no actual consensus exists. Several epidemiological studies have, however, pointed out that moderate wine drinkers tend to have healthier dietary and lifestyle habits, which would account for a better health status. In this context, wine could be regarded as a fruitive food, whose moderate and responsible consumption within an adequate diet may constitute another element of a healthy lifestyle. It should be further considered that the Mediterranean diet is rich in fruits, legumes and vegetables that are major sources of flavonoids and other phytochemicals and lack the risks of alcohol. All these aspects will be carefully examined in this lecture.



## **Lipidomics of wine and olive oil: recent contributions towards a new vision over their minor lipids with importance on human health, food quality, authenticity and sensory analysis**

### **Eliana Alves**

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The Mediterranean Diet is a worldwide reference dietary pattern. In this diet, experts recommend moderate consumption of wine and olive oil, the latter being the main source of fat. In these two so distinct matrices, there is a wide variety of lipids. While in grapes, lipids are important players in the fermentation process, in olives they are the main constituents and their functions are not yet fully known. Wine and olive oil contain minor bioactive lipids that have been little explored. In recent years, minor or unusual lipids from grapes<sup>1</sup>, wine<sup>2</sup>, olives<sup>3</sup> and olive oil<sup>4</sup> have been investigated more deeply, using sensitive and robust analytical tools based on lipidomics that rely on high-performance liquid chromatography coupled with high-resolution mass spectrometry. As a consequence, unusual fatty acids, oxylipins and various classes of polar lipids have been revealed. Many of these compounds have biological significance and derive from enzymatic or oxidative processes, from the fermentation process in the case of wine, or from the fruit's microbiome. With a new recognition of the importance of lipids in wine<sup>5</sup> and olive oil<sup>6</sup>, brought about by lipidomics, it will be possible to evaluate the impact of these compounds on human health, the quality of these foodstuff, particularly their stability and sensory perception, as well as their molecular identity and traceability. Further comprehensive lipidome profiling is needed to accomplish these goals.

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## Acknowledgments

Thanks are due to the University of Aveiro, Fundação para a Ciência e a Tecnologia (FCT, Portugal) and Ministério da Ciência e Tecnologia (MCT) for the financial support for the QOPNA research unit (FCT UID/QUI/00062/2019) through national funds and, where applicable, co-financed by the European Regional Development Fund (FEDER), within the Portugal 2020 Partnership Agreement, and to the Portuguese Mass Spectrometry Network (RNEM, LISBOA-01-0145-FEDER-402-022125). This work was also funded by national funds, through FCT, in the scope of the Individual Call to Scientific Employment Stimulus 2017 with a Junior Researcher contract (reference CEECIND/00971/2017).



## Wine “minor components” and health: setting the record straight

**Francesco Visioli**

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Moderate, i.e. 1-2 drinks/d for women and 2-3 drinks/d for men, consumption of alcohol is associated with lower all-cause mortality. Some investigators propose that wine is better than other alcoholic beverages because of the biological activities of its “minor components”. Most such molecules are phenolic in nature and might, indeed provide health benefits. This hypothesis is leading to several over-emphasized statements, largely based on in vitro experiments. The low bioavailability of wine’s (poly)phenols makes it unlikely that they can have major biological actions. The most notable example is that of antioxidant activity, which is often touted as important to health yet it is becoming less and less relevant to human physio-pathology.

In this lecture we will carefully and analytically review the available literature and discuss whether are ethanol or wine components that explain the J curve associating alcohol consumption with lower incidence of cardiovascular disease.



# Moderate alcohol consumption and lower total mortality risk: justified doubts or established facts?

**Giovanni de Gaetano**, Marialaura Bonaccio, Augusto Di Castelnuovo, Licia Iacoviello and Simona Costanzo

Department of Epidemiology and Prevention, IRCCS Neuromed, Pozzilli, Italy.



A J-shaped curve describing the relationship between alcohol consumption and total mortality, represents the range of optimum exposure to moderate alcohol, while the increased risk in life-long non-drinkers or heavy/irregular drinkers reflects sub-optimal risky exposure.

It has been suggested that lower risk of mortality associated with light-to-moderate alcohol intake might be due to a misclassification of drinking patterns (the inclusion in the reference group of high-risk subjects who had become abstainers) or to unmeasured and unknown confounders.

As a consequence, some Organizations consider alcohol to be harmful even if consumed in light amounts ("zero tolerance").

At this time, while waiting for a long-term clinical trial to provide solid answers to the controversies surrounding moderate alcohol intake, four key messages can be listed, based on the available solid epidemiological evidence:

1. Moderate alcohol should be consumed in the context of an otherwise healthy lifestyle such as Mediterranean diet.
2. The choice to consume alcohol should be made on an individual basis, taking into account both its influence on wellbeing and individual's specific health risk profile.
3. Lifelong abstainers or occasional drinkers should not adopt regular moderate drinking solely to improve their health.
4. The hazards of heavy or binge drinking should be highlighted.



## Benefits of the Mediterranean diet: how important is wine?

### Lluís Serra-Majem

Research Institute of Biomedical and Health Sciences (IUIBS), University of Las Palmas de Gran Canaria, Las Palmas, Spain. Preventive Medicine Service, Centro Hospitalario Universitario Insular Materno Infantil (CHUIMI), Canarian Health Service, Las Palmas, Spain CIBER Fisiopatología de la Obesidad y Nutrición (CIBERObn), Instituto de Salud Carlos III (ISCIII), Madrid, Spain

The Mediterranean Diet, as named by Ancel Keys circa 1960, could be considered the most studied and well-known dietary pattern in the world (Medscape, Pubmed impact). The first references to its health properties were focused on the protective effect on the incidence of cardiovascular diseases. Later on, some nutrient or food components or the diet pattern per se were associated to several pathologies, including certain types of cancer, diabetes, obesity, cognitive decline and mental health, respiratory diseases, bone diseases such as osteoarthritis, and quality of life or healthy aging, among others. The study of the mechanisms that explain such associations have come to the plausible conclusion that it is the combination of foods, nutrients in the food, non nutritive substances, cooking techniques and lifestyle habits that interact in such a way that convert the MD pattern into a preventative tool and also a treatment to be applied to such medical conditions. Besides, since the acknowledgement of the MD as an intangible cultural heritage by UNESCO, the MD pattern is also recognized as a cultural model that is deeply rooted into its geographical origin and whose agricultural and dietary practices have a responsible interaction with the environment.

Probably, the origin of wine dates back from the Neolithic, although the Egyptians and Greeks were the cultures who made the drink popular by developing the elaboration and conservation techniques. The Romans spread their cultivation in Italy and other countries and the wine became a staple. Independently of its health properties, the MD is strongly associated to the consumption of moderate quantities of wine during meals in the European Mediterranean countries. Updated benefits of wine consumption in relation to this dietary pattern will be presented.

# Inhibitory effect of wine on in vitro growth of *Helicobacter pylori*

**Maria Palma Mateus**, Dionísio, LP.; Borges, N.

University of Algarve



*Helicobacter pylori* have a direct causal relationship with chronic gastritis, gastric and duodenal ulcer, and gastric cancer. In 1994, the World Health Organization classified *H. pylori* as a type 1 carcinogen. Several epidemiological studies have shown a negative association between moderate wine consumption and the prevalence of *H. pylori* infection. In vitro studies demonstrate the antibacterial activity of wine and resveratrol on *H. pylori*.

In this lecture will be presented the results of a study carried out by the author, which had among other objectives: to evaluate the effect of different concentrations of red wine, white wine and resveratrol (a phenolic compound present in wine) on the in vitro growth of *H. pylori*. The results showed that red wine and white wine significantly inhibited *H. pylori* growth in vitro and that the inhibitory concentration of resveratrol was much higher than the content of this compound in wine. In conclusion, the results obtained suggest that moderate wine consumption may have beneficial effects against *H. pylori* infection.



## Mediterranean diet – with or without wine?

**Mladen Boban**

Department of Pharmacology, University of Split School of Medicine, Split, Croatia

The Mediterranean Diet is considered as one of the healthiest dietary patterns in the world. It is characterized by abundance in plant-based foods and the lack of processed foods. The WHO identified the Mediterranean Diet as an effective dietary strategy to prevent and control diet-related chronic diseases. Several studies examined relative importance of the individual components of the Med Diet in their contribution to the association of this diet with lower all-cause mortality. It was found that moderate consumption of alcoholic beverages, particularly wine, is a dominant component of the Med Diet as a predictor of lower mortality.

On the other side, some population studies have suggested that ANY alcoholic beverage is harmful to health.

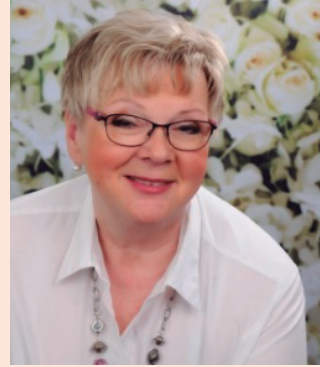
In the light of this controversy, the scientific evidence will be discussed if wine can still be part of the Mediterranean Diet, or if it should be taken out of the Mediterranean Diet pyramid.



# Organic, Biodynamic, Vegan, Natural.... Wines for a better life?

## Monika Christmann

Institute for Oenology, Hochschule Geisenheim University; Dr. Matthias Schmitt,  
Institute for Oenology, Hochschule Geisenheim University



These days more and more consumers are interested in a “healthier” life style. As a result the number of such products in the various markets has grown dramatically during the last years. But can they keep their promises? Are they better or healthier? Let`s take a closer look:

### Organic Wines

Already in 1991, the EU harmonized the rules for organic grape production. It took nearly 20 years before the production of organic wines was then subsequently regulated. Since 2012 the producers can use the letters “organic wine” also in combination with the EU organic logo.

The production of the grapes but also oenological practices, processes and treatments and the use of materials in particular additives and processing aids are strictly regulated. A main focus is for sure on the use of SO<sub>2</sub> and GMOs. A positive and a negative list of materials and techniques will be shown.

### Biodynamic Wines

No legal and binding regulations except from private organizations, where a certification by their rules is possible. In general, a gentle treatment and operations are supported. Processes that demand a high use of energy and raw material should be avoided. Physical methods should be preferred over chemical interventions. A positive as well as a negative list of materials and processes is also available.

A sensory comparison of wines produced conventionally, organic and biodynamic did not show any differences.

### Vegan Wines

Vegan is not identical with organic. All treatment agents of animal origin are banned and replaced by plant alternatives.

Also, for these products there is no binding legal definition except of rules of private organizations.

## **“Natural” Wines**

No specific legal definition as many different ideas and concepts are combined under this name.

Sometimes the wines are defined by private associations with a certification process. Very often these products are influenced by a socio-political movement with environmental concerns but also the fear of agri-chemical residues.

Nevertheless using a label or terminology that indicates „natural wines“ may not be considered legally correct. Maybe a „new“ category such as „Wine with little intervention“ would be more appropriate.

## **Conclusion**

A legal definition only exists for organic wines. All other products are legally not described but can be certified by private organizations.

Looking to the past we can for sure see that the creation of these products was very important and helpful to rethink our activities in particular considering environmental impacts but also helping in lowering our material use in vitivini.

The question if the wines are of better quality and healthier remains still open.

# Wine and cancer risk in the context of a healthy diet and lifestyle

## Ramon Estruch

Barcelona University, Barcelona, Spain



A headline saying that alcohol increases the risk of breast cancer by 30% sounds pretty scary. But what does it actually mean?

Can a glass of wine with the meal still be enjoyed or is there a health/cancer risk?

Relative risks are often reported in newspaper headlines but this information is meaningless without the context of other dietary and lifestyle factors and the absolute risks in a population. Up to now, evidences on the relationship between cancer risk and light-to-moderate alcohol consumption are very weak, since most of the studies have not taken into account several factors, mainly type of alcoholic beverage consumed, drinking pattern, dietary pattern and other lifestyle factors. Cancer risk attributed to moderate wine consumption in the context of a healthy diet and lifestyle will be discussed and addressed.

# Moderate wine consumption and weight management

**Rosa M Lamuela-Raventós<sup>\*1,2,3</sup>, Inés Domínguez-López<sup>1,2</sup>,  
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Wine has always been an important part of diet, gastronomy and conviviality and has been changing from an important source of nutrition to a cultural complement to food over the years. As we know, a balanced diet is one of the key elements for a healthy lifestyle.

Recent years have seen a high increase in obesity problems. Alcoholic beverages provide “empty” calories and this is the main reason why they are eliminated from a weight-loss diet. Considering alcoholic beverages in general, there are some discrepancies with the results. It is currently unclear, whether the consumption of alcoholic beverages is a risk factor for weight gain because studies performed to date have found positive, negative, or no associations. At the same time, the scientific evidence shows that light-to-moderate wine intake may be more likely to protect against weight gain, or abdominal adiposity. Because wine does not only contain ethanol, but it is also rich in polyphenols. Wine is one of the main sources of polyphenols in Mediterranean diet. One hundred milliliters of wine may supply 200 mg of polyphenols. Polyphenol intake has been correlated with a decrease in body weight and waist circumference. A higher intake of foods rich in flavonols, flavan-3-ols, anthocyanins, and flavonoid polymers that are present in red wine seems to contribute to weight maintenance in adulthood.



# Wine in Moderation – wine consumption in context of a healthy diet and lifestyle



## Ursula G. Fradera

Project Manager, Deutsche Weinakademie GmbH, Germany. Wine in Moderation (WiM) Association Vice President. Wine Information Council (WIC) Scientific Coordinator

A Wine in Moderation (WIM) is the initiative created by the European wine sector to inspire moderation when drinking wine, as well as respect for wine as a product of culture among people who choose to drink, thereby contributing to a healthy lifestyle and the reduction of alcohol related harm. WIM builds on scientific evidence, education and responsible commercial communication to empower wine professionals with the information and tools with which they may responsibly present wine, raising awareness and knowledge about responsible drinking patterns and moderate wine consumption.

Moderate and responsible wine consumption can be part of a healthy lifestyle and a Mediterranean diet, however, recent media reports have questioned the health benefits of moderate wine intake and have contributed to a considerable uncertainty not only among wine professionals but also the general public. Thus, it is very important to analyze the scientific publications that result in controversial headlines and put them in context/perspective. An objective and evidence-based scientific information in the education of wine professionals, and in the communication to wine drinkers, is the key for Wine in Moderation. Only in this way can consumers make informed decisions about choosing whether or not to drink, sharing wine with friends during a meal and caring about their safety and that of others.



# Oral Communications

# EFFECT OF COLLETOTRICHUM ACUTATUM ON THE QUALITY OF OLIVES FROM DIFFERENT CULTIVARS DURING THE MATURATION PROCESS

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Olive is one of the most important crops in the Mediterranean basin that is susceptible to some diseases, such as verticillium wilt (*Verticillium dahliae*), olive fly (*Bactrocera oleae*), and olive anthracnose (*Colletotrichum acutatum* and *Colletotrichum gloeosporioides*), that diminish the yield and quality of olive fruits and therefore the stability of olive oils. In this work, the effect of *Colletotrichum acutatum* in three cultivars (Cobrançosa, Galega Vulgar and Picual) was studied at three different maturity stages (green, semi-green and ripe) in terms of phenolic composition (colorimetric and chromatographic methods) and antioxidant capacity.

The effect of this fungus caused a marked decrease in the phenolic composition of the different cultivars presenting values of total phenols from  $12.69 \pm 0.91$  and  $57.23 \pm 3.47$  mg AG g<sup>-1</sup> to  $4.87 \pm 0.16$  and  $25.67 \pm 2.66$  mg AG g<sup>-1</sup> in uninfected and infected olives, respectively. The content of ortho-diphenols ranged from  $12.10 \pm 0.79$  -  $84.14 \pm 9.22$  mg AG g<sup>-1</sup> to  $4.20 \pm 0.49$  -  $23.49 \pm 1.11$  mg AG g<sup>-1</sup> for uninfected and infected olives, respectively.

The antioxidant capacity varied between  $0.45 \pm 0.02$  and  $2.08 \pm 0.12$  mM Trolox g<sup>-1</sup> for the healthy olives and between  $0.14 \pm 0.01$  and  $0.74 \pm 0.08$  mM Trolox g<sup>-1</sup> for the infected samples, which correspond to a decrease due to the attack of the fungus, as it happened with the determination of the phenolic content.

Finally, the HPLC analysis revealed also a decrease of the majority of the phenolic compounds, being tyrosol the compound in the highest concentration. It was also noted that the cultivar Galega Vulgar presented the highest degradation of phenolic compounds and the cultivar Picual, although presented a decrease of phenolics in the first two ripening stages (green and semi-green), in the latter stage (ripe), an increase of compounds was observed.

## Acknowledgements:

This work was supported by national funds from FCT – Portuguese Foundation for Science and Technology, under the project UIDB/04033/2020.

# DEVELOPMENT OF A SUSTAINABILITY PROGRAM FOR THE ITALIAN OLIVE-OIL SUPPLY CHAIN

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**Introduction:** Sustainability is a consolidated decision-making lever for consumers, who are increasingly attentive to environmental, social and food quality issues. Consequently, Italian olive growing, historically burdened by fragmentation, must aim at the transition to economically and environmentally sustainable management systems, linked to premium quality production and to a remunerated context of biodiversity conservation. The drafting of a sustainability program for the olive-oil supply chain is therefore aimed at providing a technical support for the Italian olive growers through the promotion of environmental, socio-economic and cultural sustainability practices.

**Methods:** The formulation of the technical standard was based on the National Integrated Production Quality System (SQNPI), national regulations, best practices, scientific evidences, the ISO 26000:2010-Social Responsibility Standard and public and private sustainability standards. For the selection of the requirements, the production processes of the agricultural and the olive mill phase, have been characterized in terms of environmental sustainability, food safety and quality, ethically and socially responsible behaviors, olive biodiversity and cultural heritage protection, profitability and the fair sharing of value among stakeholders.

**Results:** 38 requirements have been selected, divided according to the four pillars of sustainability: Environmental (19), Food Quality/Safety (5), Social (9) and Economic (5). Mandatory actions and best practices are envisaged for each requirement. These requirements are now being validated through the participation of some pilot companies. Preliminary results demonstrate a strong interest of the farmer despite a low level of education and training in the sustainability aspects of the protocol implemented. Strategy for the participation activities and engagement should be preliminary to any collection of data either in the oil process phases and farm organization.

**Conclusions:** The development of a sustainability specification ultimately aims to represent a reference for the Italian olive oil companies in the definition of a sustainability plan and the improvement process through the definition of specific verifiable objectives, and periodic review along the olive-oil chain.

This research was funded by TERRE DELL'OLIVO - Sviluppo di supporti operativi per la valorizzazione e promozione di una filiera olivicola altamente sostenibile in Emilia-Romagna, PSR Domanda di sostegno n. 5111598.

# TAILOR-MADE POLYMERS FOR THE VALORIZATION OF POLYPHENOLS PRESENT IN THE WINE AND OLIVE OIL RESIDUES.

Amir Bzainia<sup>2</sup>, Catarina P. Gomes<sup>1</sup>, Rolando C.S. Dias<sup>1</sup>, Joana S. Amaral<sup>1</sup>, Mário R.P.F.N. Costa<sup>2</sup>

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Several natural polyphenols confer a multitude of health benefits thus attracting the interest of the pharmaceutical and food industries for their commercial use. However, their weight content in raw materials is rather small and efficient enrichment and purification methods must be used. In the present research, we explore molecularly imprinted techniques to purify polyphenols present in wine and olive oil production residues. Molecularly Imprinted polymers (MIPs) are polymer networks with tailor-made cavities, having high specificity/affinity towards a target molecule (akin to an artificial antibody). Depending on the conditions of synthesis, the type of interactions between MIPs and polyphenols could be covalent or/and non-covalent. Networks used as MIPs can be produced through different types of polymerization methods such as classical free radical polymerization and its 'controlled' reversibly deactivated counterpart. In this research tailored adsorbent particles targeting polyphenols have been produced using classical free radical polymerization leading to materials based on 4-vinylphenylboronic acid monomer (4VBA) and 4-vinylpyridine (4VP), and controlled radical polymerization was used to make hybrid microcrystalline cellulose grafted structures MCC-P(4VP). Both synthetic and hybrid materials were used as adsorbents for the phenolic compounds existing in the wine and olive oil residue extracts. The purification of polyphenols was carried out in a continuous process (solid phase extraction) or in a batch process.

Different phenolic compounds such as quercetin and oleuropein were already identified in the residues' extracts and purified using the synthesized MIPs. This demonstrates the usefulness of such materials for the valorization of wine and olive oil wastes in industries.

This work is a result of the project "BacchusTech - Integrated Approach for the Valorization of Winemaking Residues" (POCI-01-0247-FEDER-069583), supported by the Competitiveness and Internationalization Operational Program (COMPETE 2020), under the PORTUGAL 2020 Partnership Agreement, through the European Regional Development Fund (ERDF).



# PHARMACOKINETICS OF TABLE AND PORT RED WINE ANTHOCYANINS: A CROSSOVER TRIAL IN HEALTHY MEN

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Besides all the biological effects described for red wine or its main polyphenolic components, there is now strong evidences that the molecules responsible for those effects are not the original ones but rather their metabolites arising after absorption takes place. This discovery confers no physiological relevance to some of the in vitro and animal studies performed with the original molecules and also to studies in which the concentration ranges are above the ranges detected in human samples.

Due to the almost absence of human studies concerning red wine bioavailability, this study was designed to evaluate the pharmacokinetics of Port and table red wine anthocyanins in healthy men as an acute dose. A total of 8 normal weight ( $23.2 \pm 1.9$  kg/m<sup>2</sup>) volunteers were recruited to consume 250 mL of a table red wine or 150 mL of young Port red wine. Red wine anthocyanins were detected in their intact forms in both plasma and urine samples, but malvidin-glucuronide (MvGlucr) and peonidin-glucuronide (PnGlucr) were the two main derivatives detected after both red wines consumption. For the first time, and supported by the synthesis of standard malvidin-3-O- $\beta$ -glucuronide (Mv3Glucr), the main pathway followed by malvidin based anthocyanins after absorption was described which involves the anthocyanidin conjugation with glucuronic acid after glucose removal. Despite the lower total content of anthocyanins ingested when volunteers drank Port wine, no differences were observed in the plasma C<sub>max</sub> of MvGlucr and PnGlucr after table and Port red wine consumption. The relative bioavailability of anthocyanins in Port wine was  $96.58 \pm 5.74$  %, comparatively to the anthocyanins presented in red wine.

In conclusion, both Port and table red wine are good sources of bioavailable anthocyanins.

# BY-PRODUCTS FROM THE WINERY INDUSTRY: OPTIMIZATION OF THE EXTRACTION METHODOLOGY OF GRAPE POMACE COLORANTS FOR POSSIBLE FOOD APPLICATIONS

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The winery industry is able to produce millions of tons of by-products, representing both environmentally and economically a problem in the control of these residues. Grape pomace is recognized as an agro-industrial waste and one of the main solid organic wastes generated during wine production. Consisting mostly by skin, grains and sometimes some stems, it is a mixture of biodegradable solids obtained after fermentation or after the pressing process. Due to its high antioxidant capacity and source of bioactive compounds, grape pomace can contribute to the enrichment of several products and foods from different industries. Furthermore, due to the greater concern of consumers in the use of additives in food, it is important to look for natural and safe alternatives from foods rich in antioxidants.

This study aims to take advantage of the winery industry by-products, extracting colorants from grape pomace (from Touriga Nacional and Sousão), to give them an added value. A Response Surface Methodology (RSM) was used to optimize the best extraction conditions according to 3 independent variables: solvent, temperature and pH. With a total of 27 different samples, the antioxidant activity was determined (ABTS, DPPH and FRAP assays) as well as phytochemical parameters (total phenols, ortho-diphenols and flavonoids). In addition to all these parameters analysed, the monomeric anthocyanins were also analysed.

## Acknowledgements:

This work was supported by national funds from FCT – Portuguese Foundation for Science and Technology, under the project UIDB/04033/2020.

# TASTING LEARNING: THE ULTIMATE PARADIGM SHIFT IN THE WINE WORLD?

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## **Introduction**

The wine world has witnessed remarkable changes in last years. Under the frame of improved sustainability, changes include novel viticulture, winemaking or marketing practices. Frequently, developments imply a profound conversion in the approaches so that a paradigm shift may be claimed by the involved stakeholders. However, wine tasting education seems to escape from this evolution. Indeed, the classical sensory sequence (sight, smell, taste and overall evaluation) and the weight given to flavour description, do not consider the last evidences from neuroscience. Moreover, these global learning approaches seem to benefit commercial wine styles driven by sweetish odours and smooth mouthfeel. Therefore, the purpose of this work was to present a tasting alternative aimed at the rapid recognition of the so-called classic European style and other styles resulting from sustainable practices showing unfamiliar sensory features.

## **Methods**

Consumers with different wine involvement tasted 2 “easy” and 2 “difficult” wines without previous training. The whites were an attractive Gewurztraminer (Alsace) and a classic Chardonnay (Bourgogne) while the reds were a successful commercial dark red blend (Vinhão and Alicante Bouschet) and a Pinot Noir (Bourgogne). The tasting method was based on the emotional and familiarity responses driven by these opposed wine styles.

## **Conclusions**

Consumers were grouped based on wine preferences. The “Primary” group (38 individuals) showed responses of high pleasantness to the “easy wines”, which were considered familiar. The “difficult” wines were regarded as unpleasant and unfamiliar by this group. All wines were considered equally familiar by the 16 “Perceptive” tasters who scored highly the quality of the “difficult” wines. The “Universal” (89 tasters) group behaved similarly to the “Primary” when tasting red wines, differing in an equal preference for both white wines.

Overall, emotions proved to be a powerful tool to consumer learning, without the need for flavour description, in only one session. This approach is especially adequate to describe wines resulting from sustainable production practices that often are not in accordance with the globalized commercial styles.

# PRELIMINARY STUDY OF THE PHENOLIC COMPOSITION AND ANTIOXIDANT ACTIVITY OF BY-PRODUCTS OF THE WINERY INDUSTRY FROM THE DÃO REGION

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Wine production generates large amounts of by-products, essentially organic wastes. After the winemaking process, a big amount from the wastes is either put to compost or disposed of in open areas, causing potential environmental problems and compromising the economic sustainability and competitiveness of the winery industries. However, as a result of several years of studies by our group, we can state that the by-products present a large number of biological compounds, in some cases in high concentrations, and with important activities.

Thus, and taking into consideration that among the Portuguese Wine Regions, the Dão Region is the one with the greatest lack of information on this topic, this work aims to identify the potential of the by-products of the winery industry as sources of compounds with biological activity, through the characterization of the polyphenolic composition (qualitative and quantitative) and the determination of the biological activity of the extracts obtained in relation to experimental models in vitro (antiradical activity).

The by-products used were pruning wood, stems and lees of the varieties Touriga Nacional, Tinta Roriz, Alfrocheiro, Jaen, Borrado das Moscas and Encruzado, in which Jaen stands out in almost all the analyses performed, the highest values in ortho-diphenols, flavonoids in pruning wood and total phenols ortho-diphenols and flavonoids in the stem. In the case of lees, the red wine lees contain the highest values of total phenols, ortho-diphenols and flavonoids. Concerning the antioxidant activity, the pruning wood and stem samples from Jaen presented the highest values for ABTS, DPPH and FRAP methodologies. As expected, the red wine lees also presented the highest antioxidant capacities by these three methodologies.

## Acknowledgements:

This work was supported by national funds from FCT- Portuguese Foundation for Science and Technology, under the project UIDB/04033/2020.

# VINEAS – MEDCLIV’S COLLABORATIVE PLATFORM FOR THE VINE & WINE SECTOR

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Sustainable MEDCLIV - Mediterranean Climate Vine & Wine Ecosystem, proposes a participatory approach to adaptation and mitigation strategies for the Mediterranean vine and wine value chain.

The project aims at supporting the building of national ecosystems for tackling the challenges brought by climate change to the Vine & Wine (V&W) value chain by multi-stakeholder concertation.

The methodology includes:

1. Bringing stakeholders together in participatory events, discussing and agreeing on shared priorities and common projects;
2. Collecting and disseminating knowledge and experience, projects and other initiatives in the Mediterranean area;

The main tools applied are:

- a) A Mediterranean survey for characterization of the V&W ecosystems;
- b) Systemic tools (canvas and other participatory exercises from the System's Innovation Toolbox developed by EIT Climate KIC);
- c) VINEAS, the collaborative online platform

Results show the V&W sector as dynamic sector when it is called to action, confirmed by the +600 responses to the survey and the database of agents (+200) and projects (+70) identified in VINEAS, interested in achieving more sustainable practices towards carbon neutrality.

Questioned about the main roadblocks for innovation, stakeholders are almost unanimous by referring the lack of knowledge transfer.

This is where MEDCLIV wants to help, particularly through VINEAS, by providing a digital meeting place where stakeholders can get to know each other, find a structured database on the main topics of V&W and Climate Change, share their projects, experience and best practices, geographically and also through relational maps, where the links between actors and projects are uncovered.

The main conclusions until now show the need to prepare a more resilient future according to the perceptions of wine growers and the relevance of nurturing the national ecosystems, promoting dialogues amongst parts for the adoption of good practices and to generate new ideas in a collaborative environment.



# ANTIOXIDATIVE CAPACITY IN LOCAL BERRY AND FRUIT JUICES AND WINES PRODUCED IN LATVIA

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**Introduction:** The first professional vineyard was established in Latvia in 1640 and first grape wine were produced 5 years later, though berry, fruit and exotic (rowan, sea buckthorn, rosehip teens, dandelion) wines were popular both in past and today. Antioxidants can be found in various plants, such as fruits and berries, and also in their derivative products i.e., juices and wine. There already are number of studies on grape wines, however, the research on berry and fruit wines, which undergo processes that are similar to grape juice production and fermentation, is still lacking. Aim of study was to determine the antioxidant and antiradical capacity, as well as the concentration of polyphenols in the juices and the respective wines, and find out if it remains at the original level after fermentation.

**Methods:** Various berry and fruit juices, prepared for wine fermentation, as well as ready wine samples, were studied. To characterize the antioxidant and antiradical properties in juices and wines, the polyphenol content was determined using the Folin-Ciocalteu method, the antiradical capacity was measured using the DPPH method, and the antioxidant activity - using the FRAP method. The data obtained in the study were processed and analyzed using MS Excel programm.

**Results:** Blackcurrant, redcurrant, apple, rhubarb, gooseberry homemade juices, and their respective wines were analyzed. The highest polyphenol concentration, antiradical capacity, and antioxidant activity were determined in the blackcurrant juice and wine, while the lowest numbers were observed in the rhubarb juice and wine. There was no significant reduction in the antiradical activity or antioxidant capacity after the wine fermentation process of the respective juices, besides the fact that the activity decreased proportionally to the dilution of the juices during the wine production.

**Conclusion:** Not only various berry and fruit juices, but also wines provide valuable antioxidant and antiradical activity

The authors declare that there are no conflict of interests.

# TYROSOL PRESENT IN WINE AS AN INDIRECT SOURCE OF HYDROXYTYROSOL, EFFECTS ON ENDOTHELIAL FUNCTION AND CARDIOVASCULAR BIOMARKERS

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**Introduction:** The simple phenol hydroxytyrosol (HT) has been associated with the beneficial health effects of extra virgin olive oil. Wine contains HT at lower amounts but notably more tyrosol (Tyr). Pre-clinical studies identified Tyr hydroxylation as an additional source of HT, generated by the activity of cytochrome P450. In this work we aimed to (i) confirm Tyr to HT bioconversion in vivo in humans, and to (ii) assess the cardiovascular benefits of this bioconversion.

**Methods:** A randomized crossover controlled clinical trial was performed. Individuals at cardiovascular risk (n=33) were randomly assigned to three 4-week interventions: 1) white wine (WW), 2) WW supplemented with Tyr capsules (WW+Tyr) and 3) water ad libitum (control). Phenolic urinary recovery, endothelial function and cardiovascular biomarkers were measured before and after each intervention.

**Results:** HT urinary recovery following WW+Tyr was higher than after the other interventions ( $p<0.05$ ). WW+Tyr intervention improved endothelial function, increased plasma HDL-cholesterol and antithrombin III, and decreased plasma homocysteine, endothelin 1, and CD40L, P65/RELA, and CFH gene expression in peripheral blood mononuclear cells ( $p<0.05$ ). WW + Tyr intervention also abolished the increase in the expression of iNOS, eNOS, VEGFA, and CHF promoted by WW ( $p<0.05$ ).

**Conclusion:** Tyr, and its biotransformation into HT, promoted cardiovascular health-related benefits in humans after dietary doses of Tyr. The study design allowed the health effects of individual phenols to be singled out from the dietary matrix in which they are naturally found.

# COPPER NANOPARTICLES: AN ALTERNATIVE TO COPPER SALTS FOR DOWNY MILDEW CONTROL IN ORGANIC VINEYARDS

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Downy mildew disease is becoming a growing concern among grapevine growers, especially in organic farming. Due to climate change, milder winters, with higher minimum temperatures during the cold season, could favour fungal foliar pathogens survival generating early spring infections. Moreover, the EU Commission is increasing the restrictions on to the use of agrochemicals, limiting the use of copper to 28 kg/ha over a 7-year period. This changing scenario aims for the need of new technologies to minimize residues in fruits and reducing copper impact into the soils, while crop protection is maintained. Some of these technologies include ozone applications, interspecific hybridization and new formulations of copper, among others.

The new formulations consist in the use of copper microencapsulates enhancing the adhesion and penetration of the product to the leaves. To maximize the effectiveness of copper, the particle size is reduced. These small particles, referred as nanoparticles, allow a higher surface area to volume ratio. Compared to copper salt, the copper nanoparticles improve the antimicrobial activity. Thus, this study aims to evaluate the efficacy of copper nanoparticles to control Downy mildew disease in grapevines.

According with the results, no differences were found on the control of disease pressure between copper nanoparticles and the copper oxychloride standard product. With nanoparticles products, it was achieved a 99.5% of reduction of copper applied per hectare and a 5% of reduction of the copper content into the soil.

Copper nanoparticles could be a useful tool to minimize the copper impact in soils, either applied solely in low disease pressure years or combined with copper oxychloride in high pressure years. Further research is required in order to assess if Copper nanoparticles can replace Copper salts fungicides.

# HIGHER ADHERENCE TO MEDITERRANEAN DIET IS RELATED TO LOWER PRO-INFLAMMATORY PROFILE AND INCREASED ERYTHROCYTE ANTIOXIDANT DEFENSES IN ADULTS FROM THE BALEARIC ISLANDS

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**Introduction:** The Mediterranean Diet (MD) is considered a healthy prudent dietary pattern, and a high adherence to it has been associated with a better health status, and a reduced prevalence of various chronic diseases including cardiovascular disease and several cancers. In addition, growing body of evidence suggests that the protective effects of the MD may result, at least in part, from its antioxidant and anti-inflammatory properties.

**Methods:** A random sample of the adult population of the Balearic Islands (18–65 years; 73 males and 161 females) was anthropometrically measured and provided a blood sample to determine biomarkers of inflammation and antioxidant enzyme activities. Dietary habits were assessed and the adherence to the Mediterranean dietary pattern calculated.

**Results:** The adherence to the MD was 45.1±6.8%. The activities of glutathione peroxidase and glutathione reductase were significantly higher in erythrocytes from the group above the median value (≥50%) for the adherence to MD. Higher plasma levels of adiponectin were associated with higher adherence to the MD, whereas leptin, tumor necrosis factor alpha (TNF-α), plasminogen activator inhibitor 1 (PAI-1) and high-sensitivity C-reactive protein (hs-CRP) evidenced lower levels among subjects with higher adherence to the MD.

**Conclusions:** Higher adherence to the MD is directly associated with a better profile of plasmatic inflammation markers and with elevated antioxidant defenses in erythrocytes. Since overweight contribute to systemic inflammation and oxidative stress, it raises the possibility that lifestyle interventions may provide effective means of reducing risk factors for cardiovascular disease.

# THE IMPACT OF GESTATIONAL CONSUMPTION OF PURPLE GRAPE JUICE ON CONSTRICTION OF FETAL DUCT ARTERIOSUS IN WISTAR RATS

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Introduction. This study aimed to evaluate the effect of purple grape juice consumption during the gestational period on the closure of the fetal duct arteriosus, prostaglandin levels, and oxidative stress markers in Wistar rats. Methods. We used 18 pregnant rats that were divided into four groups: water group (negative control), indomethacin group (positive control) single dose of indomethacin in DG20, group grape juice one dose (7 $\mu$ L/g of weight) during the entire gestational period, grape juice group 2 doses (14 $\mu$ L/g of weight) divided into two morning and afternoon doses throughout gestational period, all through gavage. Blood was collected on day Zero and 14th day, as well as on the 20th day after euthanasia due to exsanguination. Prostaglandin levels were dosed, and the liver was removed from mothers and fetuses' hearts for oxidative stress analysis, for analysis of the fetal duct arteriosus (DA) histology was performed. Results. We observed a decrease in prostaglandin levels on the 20th day concerning zero time, and the indomethacin group presented the lowest values; besides, it was possible to observe the closure of DA only in the indomethacin group. We observed that the juice decreased TBARS levels, and indomethacin decreased SOD activity in the mothers' liver and grape juice, two doses decreased sulfhydryls and increased activity of SOD in the heart of fetuses. Conclusions. We conclude that the use of anti-inflammatory drugs during the gestational period is harmful to DA, and grape juice presented potential antioxidant effects, but not anti-inflammatory when compared to the drug.







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