

Oeno Farma-ceuticals, From the Grape to the Glass: An e-Training Platform on Health and Safety Issues for Wine Makers and Consumers.

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ABSTRACT

A pedagogical platform has been developed as a result of a close cooperation between many actors and stakeholders of the wine sector including consumers. This long term Multi-Actor Cooperation (MAC approach) of European Universities and Wine Industries was based on Analysis of the Training Needs (TNA) of the latter sector and their expressed interest to the former, willing to produce a flexible (distance learning) and friendly to non-specialists training tool. This tool can therefore be distributed and add value to the activities and education of wine makers. It is also feasible for integration into the teaching curricula of the relative Educational and Research Institutions.

The Health aspects of wine were chosen as the most representative and “popular” Case Study of the above e-training platform. Small and Medium Enterprises (SME) and wine consumers are also interested in various Health and Safety issues linked with the quality management in all links of the chain “from the grape to the glass”

In connection with the theoretical presentation of the relevant issues, potential users of the platform can be trained through specially selected case studies, developed in the framework of synergistic research activities of the participating actors (research and training organizations).

Keywords: Multi-Actor Cooperation, Training Needs Analysis, wine, vine, Health and Safety, nutraceuticals.

1. INTRODUCTION

Beneficial factors linked with wine consumption have always attracted the interest of both wine producers and consumers. There are a lot of studies supporting the relevant theories starting from the so-called French paradox up to latest research findings attributing anti-oxidative properties to wine products. The French paradox: despite the higher lipid composition of their diet, French people do not necessarily show increased incidence of cardiovascular diseases and this, is attributed to a certain degree- to the presence of resveratrol in the wine. In a close relation to this, the anti-oxidative properties of similar wine constituents like the polyphenols, are also linked with lower incidence of cell-damage, including carcinogenesis and aging.

Despite though their beneficial effects, wine products are often contaminated with certain hazardous substances as a result of the environmental pollution (dioxins and aflatoxins found in the grapes) or from improper industrial treatments (methanol and increased

concentration of sulfites), not to exclude the adverse effects of the presence of ethanol itself.

Local wineries and relevant enterprises producing alcoholic beverages (SMEs) seeking staff-training in the above lately developed fields, have expressed their needs and interest to the collaborating Institutions in order to prepare a distance learning tool that would ameliorate the quality of their products. This e-training tool, although designated mainly for oenologists, it is developed on a more general (scientifically and technologically) background. Therefore students attending relevant Courses and consumers could also be educated and benefit from the e-learning platform of Oeno Farma-ceuticals. Finally, the e-learning platform can be used on a dual basis for the wine industry and the relative (wine) Institutions and for two main purposes: a) critical components (for the human health and the wine industry) can become known and naturally exploited; b) Hazardous for the human organism and the overall quality of the wine products will stay away from the food (wine) chain from the farm to the glass.

2. METHODOLOGY

A pedagogical platform has been developed as a result of a close cooperation between many actors and stakeholders of the wine sector including consumers. This long and fruitful Multi-Actor Cooperation (MAC approach) of European Universities, Research Institutions and Wine Industries has also produced similar training material, based on relevant Analyses of the Training Needs (TNA) of the food and beverage sector. Training products relevant to the above MAC approach have been disseminated via similar Conferences and the Internet. [1-3]. Concerning the tool (e-training platform) the TNA for Oeno Farma-ceuticals showed that wine producers and the corresponding stakeholders would be interested for an easily accessible (distance learning) and flexible (modular-type) training tool. Previous experience and ex-post evaluation of similar

training activities and projects showed also that in connection with the basic knowledge provided through these training packages, the latter have to include two critical elements; (i) a shelf-evaluation Questionnaire, usually of the Multiple Choice type and (ii) the teaching approach should be accompanied with the relevant Success Stories, taken mainly from the industrial sector. Both demands of the TNA for Oeno Farma-ceuticals were fulfilled as it is explained below.

The Modules that have been proved of having the highest priority for training among the “actors” of the Wine scene were those dealing with the Health and Safety issues. A holistic approach was implemented in order to cover the whole spectrum of the chemical, biological and nutritional parameters involved in the production and consumption of wines and alcoholic beverages, from the grape to the glass and eventually to the human body. In order to facilitate the training dimension and use of the platform, the critical (on Health and Safety issues) substances of the wine and the wine beverages, were classified in two main categories: a) beneficial compounds and b) undesirable substances.

In the class of beneficial -to human health – compounds, the flavonoids (polyphenols) and the case of resveratrol are described in more details. These compounds are found in many varieties of vines, especially the red ones. They exhibit anti-oxidant properties and they are acting as free-radical scavengers. That means that they can “capture” mutagenic entities and prevent some potentially carcinogenic reactions which are possible to take place within the human body. The anticancer properties of polyphenols can be therefore easily understood and reports in the literature are in line with this hypothesis. A second beneficial effect of the anti – oxidant activities of flavonoids is their involvement in the formation of the atheromatic plaque within the arteries of the human body. They prevent the Low Density Lipoproteins – linked with cholesterol (i.e. the LDL cholesterol or bad cholesterol) to stay in the blood and make deposits in the arteries, thus preventing

atherosclerosis, a factor linked directly with many cardiovascular episodes and strokes. Concerning the undesirable substances the training platform examines both environmental and industrial contaminants. From the environmental contaminants the platform provides information for the most frequently polluting agents which contaminate not only the grapes but also some cereals where from, certain alcoholic beverages like beer, whiskey and gin are produced. The environmental pollutants presented in the training platform "Oeno Farma-ceuticals" are the dioxins and the aflatoxins. Dioxins that are found in the grapes are usually produced from open-air fires for burning near - by agricultural residues. When they contaminate the skin of the grapes, it is difficult to remove them from the grapes and their relevant products (raisins). Since these chemicals belong to the Persistent Organic Pollutants (POP), are not water - soluble and extremely toxic, a special attention should be taken in the cultivation fields to prevent the corresponding contamination. Otherwise the grapes should be discarded. Aflatoxins and especially ochratoxin A that contaminate grapes and certain cereals, are products of metabolic reactions taking place within certain microorganisms like *Aspergillus flavus*. Therefore the only means to prevent contamination with these very toxic metabolites is to protect the relevant raw materials from developing their corresponding precursors (fungi). The safest means for prevention is to keep them away (when possible) from higher humidity and temperatures, at least during storage. The third undesirable compound produced during the vinification process is methanol. This is also toxic and it is mainly a by-product of the alcoholic fermentation, when - together with the grape sugars - other wood polysaccharides (lignin, cellulose) are present in the fermented material. The safest method for the elimination of methanol which is also called wood alcohol is to keep control of the temperature of the distillation, during production of the alcoholic drinks. Finally the issue of sulfites addition as preservative, being under surveillance from the corresponding

specifications and authorities, it is studied in connection with the research efforts to find other means and methods for the preservation of wines. (See Case Study below, on wine irradiation). Apart from the improper industrial treatments, leading to the existence of methanol and increased concentration of sulfites, health and safety training modules gave proper attention to the adverse effects of the presence of ethanol itself which can cause a plethora of health problems.

To facilitate the clear understanding from non specialists and even simple wine-consumers, an Appendix with the necessary technical and scientific terms is attached (e-linked) to the platform. Concerning the second category of the critical (to human health) substances of the wine and the alcoholic beverages, the compounds that were chosen for the relevant training are the most frequently found to contaminate and therefore to lower the quality of the polluted products. The substances chosen are either coming from the environment or from pollutants derived from improper storage (dioxins or mycotoxins – ochratoxin A), but also from technological disadvantages and/or deviations from the relevant specifications and guidelines (methanol and sulfite salts). Again, the above Appendix with the corresponding terms is linked wherever is considered necessary.

Since there are many controversial reports in the literature regarding ethanol's both beneficial effects (under moderate consumption) and adverse reactions and toxicity, the issue is presented on a separate and a more integrated Unit. The Unit starts with the biochemical reactions linked with ethanol, continues with its toxicity to human cells and body tissues and ends with the metabolic pathways that are thought to be responsible for the distribution and fate of ethanol into and from the various organs and systems of the human body. The ethanol Unit is accompanied with a practical test, assisted by a Virtual Reality training tool, similar to the well known breath alcohol test "alcotest". With this example the absorption, distribution and elimination of ethanol from the human body is better

understood, explaining also the foods that might be involved in the absorption and fate of alcohol from the human body. The ethanol Unit is also linked with one of the Success Stories presented in the e-training platform "Oeno Farma-ceuticals", taken from a joint European project, namely "Oeno-MAC" [2] The Success Story of this Unit, deals with the development of Alcohol-free wine-like products. In connection to this issue, a SWOT analysis for ethanol is presented, being concentrated more on the opportunities that the production of de-alcoholized wines might have for nutritional (minimizing calories, pregnant women, young people, etc), ethical (drivers, alcoholics, certain religions etc) and industrial/commercial (innovative/novel products) reasons.

The second success story presented in the platform is an outcome of a research project developed with collaborative activities of the authors, in their home Institutions [4-5]. This Story explains how the use of gamma – irradiation might be of use for a potential reduction or elimination, of anti-microbial agents added to the wine (like metabisulfite), at least to synergistic - with the chemicals used at present - levels, provided that such treatments obtain the necessary permission and certification from the responsible food authorities, worldwide.

4. CONCLUSIONS

A systematic approach to document and exploit the potential biological activities and health benefits of wine and alcoholic beverages, linked with the presence of nutraceuticals, is presented with the e-training platform "Oeno Farma-ceuticals". With this training tool the wine industry can approach the very promising era of nutraceuticals from their development in the vines and the grapes to the final products (wine and alcoholic beverages). Consumers of alcoholic drinks can also obtain the relevant life-long learning not only on the health benefits of wine but also on the potential danger that might be hidden in these products, especially

within their main constituent, ethanol. This tool can therefore be distributed and add value to the activities and formal education of wine makers. As a training tool for providing information via teaching and research, it is also feasible for integration into the teaching curricula of some sectoral Educational and Research Institutions.

5. REFERENCES

- [1] Agro-MAC VET - Multi Actors Cooperation for Vocational Education Training in Agro and rural business development, **Leonardo da Vinci Partnership programme**, www.agro-net.eu
- [2] Oeno-MAC, Providing Oenovation, **Leonardo da Vinci Transfer of Innovation programme**, www.oeno-mac.eu
- [3] P. Zoumpoulakis, W. Lorig, P. Zaverdinos, D. Christodouleas, G. Hatziandreou, K. Sflomos, Effects of Gamma - Irradiation on White-Wine Samples, **1st International Congress on Food Technology**, 3-6 November 2010, Antalya, Turkey.
- [4] T-I. Lafka, V.J. Sinanoglou, E.S. Lazos, "On the extraction and antioxidant activity of phenolic compounds from winery wastes", **Food Chemistry**, Vol. 104, 2007, pp. 1206–1214.
- [5] A.M. Batrinou, D. Koraki, V. Sinanoglou, A.D. Karagouni, K. Sflomos, V. Pletsas, "Effect of ionising radiation on the quantification of genetically modified foods", **Food Biotechnology**, Vol. 22, 2008, pp. 338–351.