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Title: Making visible toxicants in wine quality assessments in the early 20th century. The case of arsenic.

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Abstract:

This paper will study an economic and scientific controversy related to one cargo of Spanish wine to France in 1932, when more than 300 French sailors were poisoned by arsenic in wine. International journals as well as local wine experts were involved in the dispute, such as, Rafael Janini-Janini, a prominent Valencian agriculture engineer, and Francisco Bosch-Ariño, chemist of the Valencian customs laboratory.

The study of this dispute will show the wide range of interests related to the wine market in the 1930s. It was not just a technical controversy about wine analyses, but one quarrel involving economic, legal and commercial questions. Both, France and Spain were important wine-producing countries, and the technical controversy, and the poisoning case could affect the trade of Spanish wine. As many experts and journalists highlighted at that time, the dispute was employed to promote the French wine market, and to restrain the exports of Spanish wine. The paper will study reports prepared by Janini-Janini and Bosch-Ariño in their respective scientific spaces: a viticulture station, and a customs laboratory. The role played by different international journals involved in the controversy will also be analysed to show different approaches to wine quality, and the blurred boundaries between the chemical and the economic questions discussed. Furthermore, this paper considers how experts' work was not limited to prepare technical publications or chemical analyses, but they played an active role in the discussions to regulate the international wine market. As a result, this paper will analyse this controversy in order to discuss the relationship between chemistry and economy on the wine market in the first third of the 20th century.

Introduction

In 1932 many newspapers started reporting a large-scale case of intoxication caused by a wine cargo exported from Spain to France. The news appeared in both Spanish and French journals, as well as in others from abroad, such as the *New York Times*, or the *Singapore and Mercantile Advertiser*, informing about this case of arsenic poisoning that involved more than three hundred French merchantmen. Some years later, this case was still shown as an example of mass poisoning in some treatises of legal medicine, and, even now, is referred in different works on history of toxicology.¹ In addition to attract the interest of the public and journalists, this mass poisoning also mobilised experts, such as agriculture engineers, customs chemists, physicians, and coroners. All of them accepted the existence of arsenic in the wine, but disagreed on how that substance arrived to the wine consumed by the sailors. This paper studied their participation in the dispute, as well as the impact of the intoxication on the trade of

¹ Erich Urbach, (1946), *Skin Diseases Nutrition and Metabolism*, London, William Heinemann, p. 284; Emsley, John, (2006), *The Elements of Murder: A History of Poison*, Oxford, Oxford University Press., 99.

wine, the commercial exchanges between Spain and France, and the international regulation of wine in the 1930s.

As shown by different authors, during the nineteenth century the increase in sales volume and value of wine exports was accompanied by numerous fraud controversies, intoxications and poisonings.² New chemical substances, and new techniques and instruments were progressively employed to imitate, adulterate or counterfeit a wide variety of products. Simultaneously, the governments developed new regulations and scientific spaces to control the quality of products, public health and the taxation of merchandise. Chemistry and chemical analyses became a crucial tool to determine the composition and quality of substances, and they played a prominent role in numerous scientific controversies and commercial disputes.³ In relation to wine, the addition of fuchsine was one of the most common methods to adulterate wine during the second half of the nineteenth century, but this substance employed as a colorant or dye was toxic in its pure state and, even more, when including arsenic impurities as it was usually the case. For example, the addition of that chemical compound was the cause of the tensions generated between the governments of Spain and France due to a shipment exported from the port of Tarragona in 1878. In 1883, another dispute was discussed in the public sphere when the French government started restricting the fortification of wine; this is the addition of alcohol –either pure or distilled spirit- before the fermentation process is completed. Although the prohibition was not total, it implied that French customs authorities developed their own criteria for accepting or not the importation of wine from Spain or other countries. The restriction of the plastering of wine or addition of gypsum to must was another issue involving wine analysis that generated a great concern among the Spanish authorities, producers and exporters. In this case, the French government intended to limit the maximum amount of existing potassium sulphate in wine in 1880, but this proposal was delayed until 1893 not only because of the protests from other countries but also due to the reaction of the winegrowers from Southern France who also employed that technique to clarify wine and promote its fermentation.⁴ All the previous examples show the important role played by analytic chemistry in the trade of wine, and it also shows how the discussion on wine was intermingled with public health questions, and economic issues. Indeed, the case studied in this paper shows how all agents involved in the poisoning of 1932 made use of technical arguments to improve the position of their wines in the international market, dealt with the criticisms affecting the reputation of their wines, or faced the complex international negotiations regarding the regulation of wine in the 1930s.

This article examines the debates and controversies generated by the arsenic poisoning of 1932. First the development of the case in the public sphere is studied considering the newspapers of the time. In turn, scientific reports and technical publications edited by different experts are also analysed. These experts worked in different spaces, such as chemical laboratories, agronomy stations, hospitals and judicial institutions. Secondly, the paper studies how the experts involved in the dispute discussed about wine quality,

² Stanziani, Alessandro, (2005), *Histoire de la qualité alimentaire: (XIXe-XXe siècle)*, Paris, Seuil.

³ Bertomeu Sánchez, José Ramón, (2013), *Managing Uncertainty in the Academy and the Courtroom: Normal Arsenic and nineteenth-century Toxicology*, *Isis*, 104 (2), 197-225

⁴ Pan-Montojo, Juan, (1994), *La bodega del mundo. La vid y el vino en España (1800-1936)*, Madrid, Alianza Universidad, 162-169).

and were involved, in different extents, in the control and regulation of wine and its markets, both locally in the international context.

Arsenic in wine: controversy, experts and sites.

In early April 1932, the *New York Times* launched the news of a case of arsenic poisoning involving about three hundred French officers and sailors. According to the newspaper, the poisoning was due to the intake of wine bought in Spain and the "experts" claimed the arsenic detected in the wine could have been added as a pesticide to vine or introduced to reduce wine acidity.⁵ French newspapers also echoed the news. As reported by *L'express du Midi*, the first cases of poisoning had being detected three months before, and two deaths had been caused by this intoxication, which had initiated a judicial process.⁶ Two days later, the French-Swiss journal the *Novelliste Valaisan* denied the existence of two mortal victims due to this case, but confirmed the arsenic contamination of the wine and added that part of the wine cargo had been unloaded or drunk on-board, and another was retained by the port authorities of Le Havre.⁷ Finally, Spanish newspapers also reported this case at the end of April 1932, informing that the suspicious cargo had been shipped from the El Grao de Valencia port. The Valencian newspaper *La Correspondencia de Valencia* reported that 40 sailors were severely ill and 12 were hospitalized because of the intake of wine containing 3 to 12 milligrams of arsenic per litre. The source or origin of the contamination was unknown, but it was acquainted that the French shipping company *Société des Enrepôts Dubuffet* had carried the wine from Valencia to Le Havre, where had been distributed to other navigation companies.⁸ The Dubuffet company was one of the most important of Le Havre and, at that time it was extremely interested in commercialising wine from other places such as Algiers, the capital city of Algeria, where it had recently opened a new warehouse.⁹ The day after its first report, the Valencian newspaper balanced its information adding that the authorities had not yet been able to determine whether the wine had been contaminated by arsenic before been shipped or, on the contrary, had been adulterated later.¹⁰ Thus the newspaper aligned with its local interest, and opened the discussion about the origin or the source of the intoxication.

None of the parties argued that the arsenic present in the wine was the cause of the poisoning, but the key problem was to determine how the contamination had occurred. In June 1932, the *Journal of the American Medical Association* compared this intoxication with a mass poisoning produced in Toulon in 1888, causing 500 poisonings and 15 deaths, and with the Liverpool affaire of 1901, where the arsenic contamination of beer caused 6000 poisonings and 70 deaths.¹¹ This medical journal was very cautious, and state that the question as to how the arsenic got into the wine was not yet

⁵ 300 French sailors poisoned by arsenic in wine rations, *The New York Times*, p. 9, 2/04/1932.

⁶ Du vin d'Espagne à l'arsenic. Des certaines d'íntoxiqués, *L'express du Midi*, p. 2, 25/04/1932.

⁷ Le vin d'Espagne à l'arsenic, *Novelliste valaisan. Journal quotidien*, p.2, 27/04/1932.

⁸ En el puerto del Havre más de 300 intoxicados por beber vinos españoles, *La Correspondencia de Valencia*, p. 4, 27/04/1932.

⁹ Una intoxicación de las tripulaciones de varios barcos francés, *La Prensa: diario republicano*, 04/05/1932, p.2; Claude Malon, (2001), *Le Havre colonial de 1880 à 1960*, Coen, Publications des Universités de do Rouen et du Havre, p.215.

¹⁰ Los envenenados con vinos que contenían arsénico siguen aumentando, *La Correspondencia de Valencia*, p. 6, 28/04/1932.

¹¹ Sumner, James, (2013), *Brewing science, technology and print, 1700-1880*, London, Pickering & Chatto..

settled, and proposed the following three plausible assumptions: the spraying of the vines with copper sulphate (or other arsenic-containing solutions) to protect them against insects; the use of sulphur to the wine casks or barrels during the cleaning process, or the addition of sugar -contaminated with traces of arsenic- for facilitating the alcoholic fermentation of must (chaptalisation).¹² Evidently the responsible for the poisoning (the viticulturist, the winemaker, the exporter, the carrier, the storage, the seller ...) would be different depending on the source of the contamination. Then different experts became involved in the dispute with the dispute with their own interests, objectives and scientific arguments.

In June 1932 the coroner of the court of Le Havre, wrote to the Spanish authorities reporting briefly on the case and requesting more information. His report highlighted that the Spanish company *Vinícola Valenciana*, located in the Grao de Valencia port, sold the wine to the French firm *Société des Enrepôts Dubuffet*, which in turn supplied wine to other shipping companies. In this preliminary report, the coroner exonerated the house Dubuffet stating that the wine was never stored in its central warehouses but directly passed from its ships to the dock deposits of Le Havre, which were under the control of the customs authorities of that port. The official document also informed that the suspicious cargo consisted of 165 barrels of 600 litres each arrived to Le Havre on 3 December 1931, and retained later by the French fraud enforcement service (*Service de la Répression des Fraudes*). As a result, the court initiated judicial proceedings for infringement of the penal code with involuntary damages and asked the Spanish authorities to prepare a sworn statement. The coroner required diverse information such as reports provided by the Spanish firm *Sociedad Vinícola Valenciana* located at the Grao de Valencia, as well as information about the viniculture procedures used to cultivate the vines of the region, the kind of substances employed during the winemaking, and the provenance of such as chemicals to facilitate the judicial investigation of the origin and cause of the arsenic intoxication.¹³ Moreover, the coroner indicated that, after been analysed by an expert appointed by the court, 7 samples were found with no trace of arsenic and the remaining 10 contained between 8.9 and 95 milligrams per litre. The expert commissioned by the French authorities was René Vinzent, head of the laboratory of hospitals of Le Havre and former director of the laboratory of the Pasteur Institute.¹⁴ In July 1932 he published an extended report at the *Annales de dermatologie et de syphiligraphie*, where he described the clinical effects of the poisoning -light diarrhoea, cutaneous symptoms, neuritis, etc.-, and noted that sailors were more injured than machinists because the first were supplied with a double portion of wine, while Arab sailors were unaffected. However, that medical report not only left unresolved the question of the origin of the contamination of wine, but also corrected the results mentioned by the coroner, stating that the wine contained from 3 to 12 mg/l of arsenic metalloid.¹⁵ In 1932, other medical reports were also published at some German journal, but the chemical issue was not discussed and were concentrated on the medical aspects, indicating that gastrointestinal disorders, pigmentation

¹² Arsenic poisoning from contaminated wine, *Journal of the American Medical Association*, 99 (4), p. 318, 23/07/1932.

¹³ Library of the Generalitat Valenciana, Archive "Bosch Ariño", box 12.

¹⁴ En el puerto del Havre más de 300 intoxicados por beber vinos españoles, *La Correspondencia de Valencia*, p. 4, 27/04/1932.

¹⁵ Thorel, Louis; Vinzent, René, (1932), A propos d'une intoxication collective par l'arsenic, *Annales de dermatologie et de syphiligraphie*, 3 (7), 618-624.

problems, and skin abrasions were the first symptoms detected four weeks later the ingestion of wine.¹⁶

In Spain, different stakeholders participating in this dispute had begun investigating the poisoning before the French injunction. The agriculture engineer Rafael Janini (1866-1948) studied this issue jointly with Francisco Bosch Ariño (1902-1995) chemist at the customs office of Valencia, and, some years later, dean and professor of chemical analysis at the University of Valencia (fig. 01).¹⁷ Janini was General Inspector of the Corps of Agriculture Engineers in Valencia, agronomist of the Royal House, and director, between 1919 and 1924, of the Viticulture and Oenology Station of Requena (created in Valencia in 1911).¹⁸ Janini corresponded several times with Bosch, providing information on wines produced in Requena and requesting assistance for the preparation of a report on wine analyses with specific information on arsenic determination.¹⁹ As a result of his direct interest in the arsenic controversy, Janini got the publication of his book *El arsénico en el vino* (Arsenic in wine) by the Spanish Ministry of Agriculture in 1933, which included the chemical report of Bosch jointly with the reports prepared by other five experts.²⁰ The same year Janini also prepared a handwritten version in French language of 180 pages.²¹ That work was eventually awarded with a prize of 500 francs by the International Wine Office, an institution created in 1924 in Paris that began its operations in 1927 to regulate the trade of wine, and arbitrate possible conflicts among its founding members, most of them Mediterranean countries.²² The official publication of Janini included an extensive literature review on the presence of arsenic in wine, followed by the reports of several Spanish agriculture engineers, an oenologist and a customs chemist. One of the experts was José Salinas Iranzo, a former disciple of Janini at the Viticulture Station of Requena and professor of oenology at the Agricultural Chamber of Valencia. Salinas submitted to Janini first-hand information concerning the usual processes of obtaining wine in the Valencian area, highlighting that it was not possible to add more than 0.3 grams per litre of sulfuric acid during the winemaking as a greater amount "would affect the taste", and remarking that the addition of tartaric salts (calcium tartrate) rarely reached 3 g/l, being the most common dose for Requena wines between 0.5 and 0.6 g/l.²³ In addition, Janini asked Salinas to analyse the commercial products employed for winemaking in the region with a special focus on arsenic tests. After inspecting seventy wine samples and different chemical compounds, Salinas prepared a four-page report with the conclusion that "not a single sign or suspicion about arsenic had been detected" in the wines of the

¹⁶ Tropp Caspar; Rauch, Gustav, (1932), Über eine Mssen-Arsenvergiftung nach Weingenuß an Bord, Dermatologische Wochenschrift, 95, 1023-1031. Another German paper on the same question was: Mühlens, Peter, (1932), Ueber eine Massenverglftung nach Weingenuss an Bord, Deutsche med. Wochenschrift, 58, 854-855.

¹⁷ The Valencias customs laboratory was created in 1927 under the direction of the chemist León Le Boucher Villén (1904-1937), who did not participated in the dispute because was doing a long stay abroad.

¹⁸ Del Cañizo, José, (1948), In memoriam. D. Rafael Janini (1866-1948), Boletín de Patología Vegetal y Entomología Agrícola, 16, 337-341, p. 339).

¹⁹ Letter from Janini to Bosch, June 24th, 1932, Library of the Generalitat Valenciana, Archive "Bosch Ariño", box 12.

²⁰ Janini Janini, Rafael (1933), El arsénico en los vinos, Madrid, Dirección General de Agricultura.

²¹ One copy of this work was found at the Archive of Diputación de Valencia (Spain).

²² Prix de 500 francs, (1934), Bulletin international du vin, 7 (1), 111.

²³ Letter from Janini to Bosch, June 24th, 1932, Library of the Generalitat Valenciana, Archive "Bosch Ariño", box 12.

Valencian region of Requena.²⁴ The work published by Janini also collected the opinions prepared by the agriculture engineers directing the Viticulture Station of Valdepeñas, Penedés, Reus, and Requena. The report by the engineer director of the Station of Penedés (Catalonia), Cristóbal Mestre Artigas (1879-1969) mentioned several French publications informing that arsenic could "naturally exist" in small amounts that were "harmless" to health.²⁵ Meanwhile José Romany, director of the Station of Reus (Catalonia) also based on French literature to state that the wine of that country contained arsenic in amounts between 0.012 and 0.62 mg of arsenic per litre, much more than the amount detected during his analyses of 46 wine samples from his area (Tarragona), where arsenic levels of wine were below 0.2 mg/l. Then Romany proposed to use the limit of 0.2 mg of arsenic per litre proposed as a reference to declare whether the wine should be considered as wines with traces of arsenic or not.²⁶ Therefore, both engineers intended to normalize the presence of low doses of arsenic in wine, significantly lower than the doses detected in the contaminated wine of Le Havre, but similar to the average quantity of their local wines. The most extended report contained in the Janini's publication was prepared by Francisco Bosch, customs chemist of Valencia. He proposed a new analytical method specifically designed in his laboratory for the determination of arsenic in wine with an analytical device and series of colorimetric scales designed by himself (fig. 01). Bosch also claimed that after being analysed more than 100 samples the detection of sensitive amounts of arsenic in Valencian wines was not "normal", and his result proved that only "insignificant" amounts of arsenic have been found and always "lower than the toxic limit admitted in legal medicine".²⁷ In March 1932, Bosch analysed, in the customs laboratory, 4 wine samples obtained before a notary requested by the firm *Vinícola Valenciana*. Bosch did not analysed samples of the contaminated wine but samples stored by the company and provided to him some months later. The Valencian company was interested in having a detailed chemical analysis, so it asked for the determination of the alcoholic strength (performed by Bosch following the Sallerón procedure), and the arsenic measurement. The arsenic determination was done following the method of Marsh; as it did not provide valid results, Bosch proposed a new procedure of chemical analysis to increase the sensitivity of the test which allowed him to determine that two of the samples did not contain arsenic and the other two contained just small traces of such element (from 0.4 to 0.6 mg of arsenic per litre of wine).²⁸ The efforts done by Bosch for preparing a specific method for wine shows the problems of combining the use of scientific instruments with the development of visual and organoleptic skills when dealing with very small amounts of chemical substances like arsenic.²⁹ Meanwhile, Janini identified several causes that could be related to arsenic contaminations of wine, such as: the employment of metallic materials during the winemaking; the use of substances to stop fermentation like sulphur wicks, destaining coal, the addition of impure glucose or glycerine or the fraudulent addition of tartaric acid to improve the properties of wine.

²⁴ Salinas Iranzo, José, (1933), Informe de D. José Salinas Iranzo. In: Janini Janini, Rafael, El arsénico en los vinos, Madrid, Dirección General de Agricultura, 30-33, p.33

²⁵ Mestre Artigas, Cristóbal, (1933), Informe de D. Cristóbal Mestre Artigas. In: Janini Janini, Rafael, El arsénico en los vinos, Madrid, Dirección General de Agricultura, 23-24, p. 23.

²⁶ Romany, José, (1933), Informe de D. José Romany. In: Janini Janini, Rafael, El arsénico en los vinos, Madrid, Dirección General de Agricultura, 25-30, p. 27

²⁷ Bosch Ariño, Francisco, (1933), Informe de D. Francisco Bosch Ariño. In: Janini Janini, Rafael, El arsénico en los vinos, Madrid, Dirección General de Agricultura, 33-41, p. 40

²⁸ Biblioteca de la Generalitat Valenciana, Archivo Bosch Ariño, caja 12, sin clasificar.

²⁹ José Ramón Bertomeu-Sánchez Classrooms, Salons, Academies, and Courts: Mateu Orfila (1787–1853) and Nineteenth-Century French Toxicology, *Ambix* 61 (2) (2014): 162-186, pp. 167.

However, Janini remarked that in all these cases the amount of arsenic added to wine was so low, so it could hardly be toxic. Janini argued that the most likely cause of arsenic poisoning of 1932 was related to the poor washing of the containers where wine was transported. He stressed that wine become contaminated after being in contact with these recipients cleaned with commercial sulfuric acid (i.e. impure and dilution to 10 per 100), which could eventually contain 7 mg of arsenic per litre. He also insisted in this point publishing a couple of articles in the Spanish general newspaper *ABC* in the spring of 1933, when he tried to convince the readers highlighting that the washing of "press rooms, casks, tanks, pipes, barrels, drums, and other winery materials" should be done very carefully and rinsing them several times with fresh water to avoid that "some amount of arsenic was transferred to wine" as usually occurred.³⁰

The role played by Bosch, Janini and the other experts mentioned above were not limited to prepare routine chemical analyses or technical reports, but they actively defended the reputation of the Spanish wines attacked during the 1932 controversy. The Spanish government was also concerned about the possible economic implications of the intoxication. In May 1932, the heyday of the dispute, the Spanish Minister of Agriculture travelled to Paris to meet French commerce authorities and coordinate a response with the Spanish Embassy.³¹ After that travel, and perhaps motivated by the political negotiations between both countries, the Spanish press stated that "the attorney of the French Republic" had recognized that a "non-aseptic washing of the containers" had been the cause of the poisoning, a thesis that was very convenient for the business interests of Spain.³² Authorities, engineers, chemists, producers, winemakers as well as the general press warned about the negative effects of the intoxication since the first news of the Le Havre poisoning emerged. All of them were aware of the possibility of emerging a campaign to "discredit Spanish wines" profited by other countries to prevent "against the consumption of Spanish wine", and promote their own wines to expand their markets. Like many other controversies, the termination of this dispute was not clear, and it was not closed as a result of the imposition of one position over the other, neither was resolved with an agreement. As it has been shown, most of the Spanish experts and newspapers stressed the responsibility of the shipping company, while the French opinions diverged. While some French experts stated that "the mistake was made in Spain, not in France", other pointed out that it was not clear whether the case was the result "of a contagious disease or a poisoning, because the confusion is easy, and it could last".³³ However, the controversy was abandoned through participants losing interest some months later.³⁴ After 1933, no more publications or technical reports were published by the stakeholders, nor more information appeared in the newspapers. Experts pointed out two possible causes for that mass poisoning: either the addition of arsenic compounds to the grapes or to the wine, or the negligent washing of the wine containers. Even some years after the controversy, the use of arsenic products in viticulture was under discussion. While some authors claimed for the total prohibition

³⁰ Janini Janini, Rafael, *Vino Cerveza y arsénico I*, *ABC*, p. 14, 26/05/1933; Janini Janini, Rafael, *Vino Cerveza y arsénico II*, *ABC*, p. 15, 02/06/1933.

³¹ *Extranjero*, *El Magisterio Español*, p. 16, 17/05/1932.

³² *Extranjero*, *El Magisterio Español*, p. 16, 17/05/1932.

³³ Noël, Emile J. (1933), *Contribution à l'étude des intoxications d'origine alimentaire par l'arsenic*, Paris, Thèse Université Paris; Chavigny, P., (1933), *Comptes rendus du XVIII congrès de médecine légale de langue française*, *Annales de médecine légale, de criminologie et de police scientifique*, 1, 81-148, p. 139.

³⁴ Mc. Mullin, E. (1987), *970Scientific controversy and its termination*. In: Engelhardt, H.T.; Caplan, A.L, eds. *Scientific Controversies: Case Studies in the Resolution and Closure of Disputes in Science and Technology*, Cambridge, Cambridge University Press, 49-91. 77-81).

of those products, other limited their concerns about specific compounds such as the lead arsenate, or just recommended a more cautious use of arsenical compounds.³⁵ In any case, this controversy offers some clues to analyse the relationship between different experts and their local context, the strategies they employed to display and discuss their arguments as well as the role played by mass media and public sphere.³⁶ Moreover, the temporal framework of this quarrel is also very relevant. On the one hand, new regulations about wine, as well as the professional skills and the legitimacy of the experts were being discussed both in Spain and abroad. On the other, the international market of wine and its regulation was in dispute, and some countries such as Italy, Portugal and France were facing the traditional commercial domain of French wines affected by the phylloxera plague and the World War I effects. The following section will consider how this controversy about the arsenic contamination did not only involve a chemical discussion, but it was part of a much broader diplomatic dispute, at a time when different wine-producers countries were negotiating about the commerce of wine, its regulations, and its standards.



Photographs of Rafael Janini (right), Francisco Bosch (centre), and images of the technique designed by Bosch to determine arsenic in wine.³⁷

Arсенic, wine quality and economy

Scientists' involvement in disputes and controversies affected their social consideration, and created a blurred boundary between their status as experts or as authorities.³⁸ Their usual collaboration with the periodical press or their participation as court witnesses could be employed to evaluate their scientific knowledge, or to find out their personal or political interests on the question discussed. For instance, the customs chemist Bosch

³⁵ Porot, Maurice, (1938), *Les intoxications arsenicales par le vin et les produits viticoles*, Alger, Ancienne Imprimeries Victor Heintz, p.14

³⁶ Beder, Sharon. *Controversy and Closure: Sydney's Beaches in Crisis*. *Social Studies of Science*. 1991; 21: 223-256.

³⁷ Janini's photography http://bv.gva.es/documentos/mayo2014/Francisco%20Bosch%20Arino_spi.pdf (01/10/2015); Bosch's photography and image <http://www.lasprovincias.es/v/20140106/valencia/capitan-lucha-contra-filoxera-20140106.html> (01/10/2015).

³⁸ Graeme Gooday, "Liars, Experts, and Authorities," *History of Science* 46 (2008): 431–456, p. 454.

Ariño affirmed that before the arsenic case of 1933 "no other poisonings involving Spanish wine had ever been reported".³⁹ In spite of the Bosch's statement, authorities, experts and general press had been previously concerned above other poisoning cases related to Spanish wines. Apart from the controversies mentioned in the introduction of this paper, a similar dispute involving the participation of a customs chemist and the investigation by both a coroner and local authorities arose in 1892 in PortBou (Catalonia), although with smaller proportions than the Le Havre case.⁴⁰ As noted above, poisoning cases of wine -and other products- did not only involved a scientific or medical controversy on the potential risks associated to chemical products, but were also employed by different stakeholders to support their own economic, personal or political interests. On many occasions, controversies on wine analyses were intermingled with the commercial interests of different regions or countries in conflict. Usually, each party had a different position to regulate and ensure the quality of wine. Until the late nineteenth century, numerous wine growers, wholesalers, brokers and exporters argued that the inspection of shops and markets combined with a rigorous application of the penal code was enough to fight against wine adulteration, as they felt as a bureaucratic interference the requirement of a wine certificate issued by the administration. However, the growth of wine adulterations impacted on the prestige of Spanish wine, motivating protectionist measures by other countries, such as France. Simultaneously, some representatives of the Spanish agricultural sector started pressuring for introducing, progressively, regulatory measures by the Spanish administration to improve the quality of the Spanish wine, and protect the market from their own excesses.⁴¹

The foreign press of the time recognized the cause of the 1932 poisoning was unclear, but initially assumed that might be caused by the employment of arsenic compounds to vine as a pesticide or the addition of chemicals to wine with the aim of improving its properties.⁴² However, Spanish experts also considered another possible source of contamination: the arsenic content of sulphurous acid used to clean the barrels or tanks in which wine was transported. The journalist and medical student Enrique Badenes Gallach pointed in that direction by stating, in the journal *El Sol*, that the contaminated wine from Le Havre had been controlled by the French company during more than four months, so it may have suffered "all sorts of manipulations" even without leaving the customs warehouse as the merchants were allowed to transfer the wine from different containers preparing it for sale within the port docks.⁴³ The same opinion was also defended by the Spanish Association of Winemakers (*Asociación Nacional de Vinicultores*) in a note sent to numerous Spanish newspapers in the spring of 1932. From 1922 that association gathered exporters and distributors of wine in Spain, and pressured the government to sign international trade agreements, in the critical period after WWI, when Spanish exports of wine dropped from 1.8 million hectolitres in 1929

³⁹ Bosch Ariño, Francisco, (1933), Informe de D. Francisco Bosch Ariño. In: Janini Janini, Rafael, El arsénico en los vinos, Madrid, Dirección General de Agricultura, 33-41, p. 40)

⁴⁰ Correspondencia, *El Noticiero*, p. 6, 18/02/1892.

⁴¹ Pan-Montojo, Juan, (1994), La bodega del mundo. La vid y el vino en España (1800-1936), Madrid, Alianza Universidad, 165-172)

⁴² Arsenic in wine. 300 cases of poisoning at Le Havre, *The Singapore and Mercantile Advertiser*, p. 14, 24/05/1932.

⁴³ Badenes, Enrique, Las intoxicaciones de El Havre no fueron producidas por vinos españoles. Desde hace seis meses Valencia no exporta vinos a Francia, *El Sol*, p.3, 10/05/1932.

to 0.3 million in 1934, due to the obstacles of the French market.⁴⁴ The note published by that association underlined that wine was supplied by a problematic shipping company based in Havre, which "did not go through these trances" for the first time. They also stated that the French company tried to elude their own responsibility when affirming that the poisoning resulted of "a late sulphated of the vine without its subsequent washing." The association also highlighted that the wine might be exported in good conditions and contaminated later, otherwise the "analytical reports" done at Le Havre port would have rejected the importation of the wine. Therefore, the association demanded an official statement stating that the credit and reputation of Spanish wine should be restored.⁴⁵ In any case, most of the points rose by the associated were aligned with Janini's hypothesis. Other experts, as well as different treatises on legal medicine, and even historical works published some years later also agreed that the contamination of the wine was caused because of a careless use of the wine recipients or containers.⁴⁶ Moreover, this argument had also been developed in previous scientific controversies related to wine adulteration. For example, in the 1880s several cases of fuchsine poisoning involving Spanish wines exported to France were reported. On that occasion, instead of doing more energetic actions, Spanish authorities assumed that the contamination was produced by remains of fuchsine existing in the transport tanks.⁴⁷

On the other hand, Janini's report also studied the normative and regulations on food hygiene applied to arsenic in several countries. He affirmed than none specific laws were passed regulating the use of this chemical, and the only norm passed to avoid arsenic poisoning in alcohol beverages was enacted in France to regulate the use of impure glucose, with very little practical effects to improve the quality of malts, beers or wines produced in that country. However, Janini profited his publications to claim that the role of engineers and experts involved in wine control should be strengthened, and claimed that the determination of arsenic in wine and beer should be a "compulsory and current" practice. He reinforced his argument stating that the analytical procedure proposed by his Valencian colleague Bosch would transform the wine analysis from a "uncertain, annoying, long or difficult" operation into an affordable method which did not require "special materials or delicate manipulations" and was easy to undertake by the majority of chemists.⁴⁸ As shown below, Janini recommended that "people sufficiently trained in chemistry" should play a prominent role in the international agreements to ensure wine quality discussed, at that moment, by the governments of France, Italy, Germany, Portugal and Spain.⁴⁹ Thus, the experts involved in the

⁴⁴ García Bartolomé, Juan Manuel (coord.), (2011), *Historia del Ministerio de Agricultura 1900-2008. Política agraria y pesquera de España*, Madrid, Ministerio de Medio Ambiente y Medio Rural y Marino, 120)

⁴⁵ La campaña extranjera contra los vinos españoles, *La correspondencia de Valencia*, p. 4, 21/05/1932. A similar note was published in other Spanish newspapers like: *La campaña francesa contra los vinos españoles*, *ABC*, p. 45, 15/05/1932; *La campaña francesa contra los vinos españoles*, *Heraldo de Madrid*, p.3, 13/05/1932; *La campaña francesa contra los vinos españoles*, *El Luchador*, p. 6, 14/05/1932; *La campaña extranjera contra los vinos españoles*, *El Luchador*, p. 1, 19/05/1932; *La campaña francesa contra los vinos españoles*, *La Libertad*, p. 2, 13/05/1932; *La campaña extranjera contra los vinos españoles*, *Luz*, p. 04, 04/05/1932.

⁴⁶ Modi, Jaising P., (1957), *Textbook of Medical Jurisprudence and Toxicology*, 10th ed., Edinburgh, E. & S. Livingstone Ltd. P. 512); Fourche, Rémi, (2004), *Contribution à l'histoire de la protection phytosanitaire dans l'agriculture française (1880-1)*, Lyon, Université Lumière Lyon 2

⁴⁷ Pan-Montojo, Juan, (1994), *La bodega del mundo. La vid y el vino en España (1800-1936)*, Madrid, Alianza Universidad. P. 165)

⁴⁸ Janini Janini, Rafael (1933), *El arsénico en los vinos*, Madrid, Dirección General de Agricultura., 5-6).

⁴⁹ Janini Janini, Rafael (1933), *El arsénico en los vinos*, Madrid, Dirección General de Agricultura., 9)

controversy were not limited to the preparation of scientific reports, or to provide technical information but they actively participated in the economic, politic and diplomatic aspects of the dispute. Apart of the news published by Janini in the general press, the Valencian customs chemists also shared that goal as he affirmed that “his most urgent and necessary task” consisted in the “defence of our wines”.⁵⁰ Bosch also profited his report to vindicate "the purity of our exquisite wines as well as the dignity of our winemakers" and took the opportunity to request the hiring of "staff with high chemistry skills" to improve winemaking teaching and practises in the Spanish viticulture stations.⁵¹ Thus, the activities of the experts went beyond the public sphere to vindicate their work and request more resources and support. The efforts of the Spanish engineers and chemists show how scientific experts are not neutral actors, but people with their own professional, social, and economic interests. As a result, scientists, such as Janini or Bosch, become a sort of “delegated authority” where their own private interests was jumbled with the political agenda of their government or their local institutions.⁵²

Regarding commercial issues, some newspapers of that time claimed that the controversy could also affect French interests because French producers could find problems to complete the *coupage* or wine blending if restrictions on cheap Spanish imported wine were established. As stated in the journal *El Sol*, wines produced in France were "less rich in alcohol, colour and other features required for a good table wine", and the abundant vine crop produced in France in 1932 required more imports of Spanish wine to eventually improve their local wines. This seemed a conciliatory position as stated that Spanish wines were not a threat to the French market but a great opportunity to enrich other countries wine.⁵³ However, this approach was threatened by at least two important issues. First, the French market began to develop in 1919 regulations on designations of origin (*appellation d'origine contrôlée*) limiting the blending of wines from different areas, and controlling the process of wine production.⁵⁴ In addition, in 1932, the year of the dispute studied, the Union of French Winemakers (*Fédération des Associations Viticoles de France*) - which brought together many French winemakers - created a section of great vintages (*section des grands crus*) to protect the prestige of their best wines, reinforcing the protectionist positions of the French producers.⁵⁵ The second element complicating the consensus was the commercial battlefield going out in the general press, where some journals heightened the atmosphere when highlighting that the rose of new tariffs or taxes by the French customs authorities was an attack to the Spanish wine, and demanded, in turn, that the Spanish government increased the importation taxes of eggs from the French side of Morocco because Spain was the first customer for this products.⁵⁶ However, the

⁵⁰ Bosch Ariño, Francisco, (1933), Informe de D. Francisco Bosch Ariño. In: Janini Janini, Rafael, *El arsénico en los vinos*, Madrid, Dirección General de Agricultura, 33-41, p. 38)

⁵¹ Bosch Ariño, Francisco, (1933), Informe de D. Francisco Bosch Ariño. In: Janini Janini, Rafael, *El arsénico en los vinos*, Madrid, Dirección General de Agricultura, 33-41, p. 40).

⁵² JASANOFF, S., (2003), (No?) Accounting for Expertise, *Science and Public Policy*, 30, 3, 157-62.

⁵³ Badenes, Enrique, Las intoxicaciones de El Havre no fueron producidas por vinos españoles. Desde hace seis meses Valencia no exporta vinos a Francia, *El Sol*, p.3, 10/05/1932.

⁵⁴ Paul, Harry W., (1996), *Science, vine, and wine in Modern France*, Cambridge, Cambridge University Press., p.102)

⁵⁵ Quittanson, Charles, (1967), *L'Élite des vins de France, spiritueux, eaux-de-vie et liqueurs, Élite des vins de France, spiritueux, eaux-de-vie et liqueurs*, Paris, Centre National de Coordination., p.59).

⁵⁶ Una maniobra contra la importación de nuestros vinos en el Marruecos francés, *Luz*, p. 08-09, 26/04/1932.

fundamental commercial issue under the arsenic controversy was probably connected with the negotiations taking place in those years to regulate the international wine market, in which not only participated politicians and diplomats but also some of the experts involved in the arsenic poisoning, as shown below.

The participation of different kind of experts in the regulation of the wine market was not a recent phenomenon, and did not only involved agriculture engineers, agronomists and chemists but also oenologists, physicians, judges and other technicians. Indeed, the customs services was an administrative body highly dependent on accurate information on circulating merchandise, so it required technical reports and chemical analyses of a wide range of substances – from fabrics, to alloys, petrol, sugar, alcohol and others – to determine the value of imported merchandise and to apply it the correct tariff or import tax. Thus, customs services of different countries had specialised staff, and even created specific laboratories to control the international trade. Therefore, customs officers under the Ministry of Finance were not limited their fiscal and tax collection tasks, but also participated in the regulation of other products and, occasionally, undertook original research.⁵⁷ Before the creation of the central customs laboratory of Madrid, Spanish customs authorities requested chemical reports and help from local experts. For instance in 1882, the Directorate General of Customs asked Magin Bonet Bonfill (1818-1854) and Manuel Saenz-Diez García-Pinillos (1824-1893), professors of chemistry at the Faculty of Sciences of Madrid, to propose an easy method to detect fuchsine in wine for been used at the Spanish customs.⁵⁸ Some years later, in 1887, the Spanish government started controlling the free circulation of impure alcohol –alcohol not containing only ethanol- because of its serious toxicity. Then, a committee of three chemists was established to prepare an analytical method to detect impure alcohol adapted to the Spanish customs, as well as a chemical procedure to denature the confiscated impure alcohol; this is to modify its chemical properties to prevent its human consumption.⁵⁹ Eventually the government had a growing need of better technical reports and specific analytical methods to control the imports and exports of alcohol as well as many other substances such as industrial oil, petrol, coal-tar or steel. In 1888, the growth of the international exchanges and the need of scientific spaces to control them motivated the creation of a new central customs laboratory linked to the Ministry of Finance. This laboratory, in which Manuel Saenz joined as a consultant, was created in Madrid in July of 1888, at a time when other countries such as the UK, France, Italy and the United States were creating similar laboratories to prosecute fraud and ensure tax incomes.⁶⁰

Apart from the customs authorities and public institutions, other stakeholders like producers, exporters, and experts involved in the commerce of wine also demand common regulations and unified analytical methods. In 1911, a Catalan newspaper, the *Diario de Reus*, published a series of articles denouncing the problems suffered by Spanish producers and distributors when exporting their wine to France. Then, one of their main claims was the publication of a list of analytical criteria "absolutely rigid and

⁵⁷ Pan Montojo, Juan; Puig Raposo, Núria, (1995), Los grupos de interés y la regulación pública del mercado de alcoholes en España (1887-1936), *Revista de Historia Económica*, 2, 251-280, p. 256)

⁵⁸ Muller, J. T. V., (1882), *Tratado de la falsificación de los vinos*, Madrid, Librería de V. Suárez, p. 50.

⁵⁹ López González, Antonio, (1975), 50 aniversario: historia de los laboratorios de Aduanas, *Aduanas: revista de comercio internacional y estudios fiscales*, 254, 21-29., 22)

⁶⁰ Suay-Matallana, Ignacio, (2015), Customs Laboratories, chemistry and excise: an historical introduction, *World Customs Organization News*, 77, 34-37.

scientific" to certify their products and facilitate its sale in other countries. They demanded these methods were prepared considering the own characteristics of their production areas, such as weather or soil properties, since, according to them, wine was one of the products in which more "environmental influences" were appreciated. That analytic procedure should take into account "the natural conditions of the wine" and it should include a test adapted to the local context while, at the same time, accepted or recognized in the target markets.⁶¹ In 1913, The increase in claims, disputes, and demands from other sectors motivated the enactment of the Official Methods for wine analyses (*Métodos Oficiales para el análisis de los vinos*) that were intended to unify the "analytical procedures to investigate the composition and adulteration of wine", reduce disputes between producers, wholesalers and consumers, and "inspire confidence in foreign markets".⁶² These analytical methods were drafted by a commission of agronomical engineers composed by Cristóbal Mestre Artigas, director of the Viticulture Station of Penedés, mentioned above, jointly with Claudio Oliveras Massó, Victor C. Manso de Zúñiga, Guillermo Quintanilla and Antonio Dorronsoro, directors of the viticulture stations of Reus, Haro and Madrid. These methods contributed significantly to standardise the analytical procedures employed in the laboratories managed by the Ministry of Agriculture. However, it was recognized that these laboratories should be adapted to the standards employed in other countries, so the tests proposed should not be considered "permanent and definitive" but they had to be updated to meet the technical requirements of importing countries.⁶³ This official publication included a section on methods of analysis of wines for export in the total convenience of the official analyses followed by the destination country, and the suggestion of considering other regulations and legislation from the nation receiving the cargo.⁶⁴ Thus, instead of proposing a formal method including the specific characteristics of Spanish wines, as claimed by the local producers, the official act left unresolved the question of the chemical variability of wines from different regions. In addition, it also left unresolved the issue of the international validity of analyses between the exporting country and the authorities of the country receiving the imported goods.

In 1934, the Spanish government published another edition of the official methods that, as happened in the 1913 edition, did not include any reference to arsenic analyses, but proposed three types of chemical determinations depending on the complexity and the main goal of the analysis required. The range of possible tests included "mandatory determinations" detailing the chemical composition and main properties of wine, including the analysis of tartaric acid, another group of operations were just optional and, a third group involved comprehensive analyses that included the determination of sulphites, sulphur acid in white wines and colouring matter in red wines.⁶⁵ The 1934 new edition tried to solve the issue of the international standards, and included an

⁶¹ Los vinos españoles en Francia, *Diario de Reus*, 1-2, 21/06/1911.

⁶² Los vinos españoles en Francia, *Diario de Reus*, 1-2, 21/06/1911.

⁶³ Métodos oficiales para el análisis de los vinos, (1913), Madrid, Ministerio de Fomento, 3.

⁶⁴ (Métodos oficiales para el análisis de los vinos, (1913), Madrid, Ministerio de Fomento, 27.

⁶⁵ Métodos oficiales para el análisis de los vinos, 3 ed. (1934), Madrid, Ministerio de Agricultura. , 10-11. At that time, Septemebr 1932, the Spanish Wine Statute (*Estatuto del vino*) was also adopted. This regulation, started operating in May 1933 with the main goal of facilitating the production, sale and circulation of Spanish wines. However, it did not satisfied all sectors involved in the wine market as was balanced in favor of large winemakers and exporters. Fernández, Eva, (2008), El fracaso del lobby viticultor en España frente al objetivo industrializador del Estado 1920-1936, *Historia Agraria*, 45, 113-141, p. 131).

appendix of 8 pages titled International Convention for the Standardisation of Methods of Wine Analysis (*Conferencia internacional de expertos para el estudio de los métodos de análisis de los vinos*). This appendix contained the agreements decided by a panel of experts met in the conference organized in Rome in 1934 by the International Institute of Agriculture and the International Organisation of Wine with delegates from Algeria, Spain, Cyprus, Chile, Hungary, France, Italy, Switzerland and Greece.⁶⁶ The Spanish delegates were Cristóbal Mestre and Juan Marcilla Arrazola (1856-1950), director of the School of Agriculture Engineers of Madrid. Both experts had also attended a previous conference celebrated during the III International Congress of Vine and Wine held in Rome in 1932. This initiative was framed in a context of other international conferences organised to establish standards on issues such as public health, hygiene, or the control of products such as milk or saccharin.⁶⁷ The 1932 congress was organised just few months after the arsenic poisoning of Le Havre. Although one of the issues discussed was the establishment of uniform methods of wine analyses, the arsenic controversy was not on its agenda.⁶⁸ In fact, the uniformisation or standardisation of wine analyses was not only a technically complex matter, but a delicate issue affecting the economic interest of many countries. As a result, the scientific meeting organised in April of 1934 with the participation of experts from different countries, was followed and validated by a diplomatic conference held in October of 1934 to ratify the agreements proposed by the experts. The analytical procedures approved had as main objective to "facilitate international transactions" of wine and incorporated a "summarized and quick method" specially designed for the chemical tests done at, but it also included an extra "method for detailed analyses" to be employed in "extreme and dubious" cases or when was necessary to discuss about a disagreement or scientific controversy.⁶⁹ Neither the 1932 conference nor the 1934 agreement included references to the arsenic poisoning, and no specific tests or analyses to detect arsenic were proposed by these panel of experts, an element that could reinforce the idea that the 1932 arsenic controversy was more a commercial dispute than a scientific quarrel.

Conclusion

This article has studied the complex relationships between chemical analyses of wine, regulation and trade. As happened in previous scientific controversies, experts participating in this dispute related to an arsenic poisoning not only offered their technical knowledge to study the issue, but made use of their scientific authority and his professional prestige to mediate in a broader political and economic debate, and to participate in the tensions generated around the wine market in the 1930s.

The 1932 mass poisoning may have occurred for various reasons, some of them affecting the Spanish producers, and wine makers, and others affecting under the responsibility of exporters and distributors. Different experts participate in the discussion of this case, from agriculture engineers, customs chemists, oenologists, and physicians to coroners and the general press, who drafted reports, published analysis, studied the consequences of the case or requested information. Specialized press was

⁶⁶ *Métodos oficiales para el análisis de los vinos*, 3 ed. (1934), Madrid, Ministerio de Agricultura, 77-84)

⁶⁷ Guillem-Llobat, Ximo, (2011), The sugar industry, political authorities, and scientific institutions in the regulation of saccharin: Valencia (1888–1939). *Annals of Science* 68 (3), 401-424)

⁶⁸ III Congreso Internacional de la Viña y el Vino, *El Progreso Agrícola y pecuario*, 1752, 1-3, 30/11/1932

⁶⁹ *Métodos oficiales para el análisis de los vinos*, 3 ed. (1934), Madrid, Ministerio de Agricultura, 77-78)

also interested in poisoning and gave voice to other actors or groups, such as the Spanish Association of Winemakers, which had their own commercial interests. Despite the impact of the case and the involvement of such amount of stakeholders, the cause of the poisoning was never resolved, nor the responsible of the intoxication. However, the study of this case has made it possible to analyse the role of the various experts involved in the dispute and its role in the regulation of wine in the 1930s. Agriculture engineers were the largest group and hold a central role in the question, not only due to their direct relationship with producers and winemakers, but also because of their institutional positions at the Spanish wine stations. However, wine constituted one of the main Spanish exports, so chemists working at customs also played a key role in the controversy. In addition to being in charge of customs laboratories, it was assumed that these chemists had greater expertise in chemical analyses as well as a more adequate spaces and specific materials. Therefore, both kind of experts, engineers and chemists, played a major role in this poisoning, as well as in the negotiation of international standards, and the control of agricultural and industrial products circulating between different countries.

The different actors considered in this article were linked to the poisoning produced at the port of Le Havre. Some of them, - like Bosch and Janini - published chemical analyses in which not only studied different possible causes of the arsenic contamination, but also made a passionate defence of the goodness and quality of Spanish wines, with the support of local press and Spanish authorities. Likewise, French newspapers tried to maximize the consequences of the poisoning, and physicians like Vinzent were ambiguous when determining the origin of the problem. On the other hand, other experts like the agriculture engineers Mestre and Marcilla informed about the properties of some local wines to minimize de risk perception of the Spanish wines, while simultaneously employed their scientific skills to participate in the discussion of new methods to standardise wine analyses with the aim of reducing the incidents between different countries. In any case, all these experts were actively involved in the tensions related to the wine market, and played a key role in the development of new regulations to strengthen and promote the economic relations and the international trade of wine during the 1930s.

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