TRADITION AND RENOVATION IN THE ANCIENT DRUGS OF THE SPEZIERIA DI SANTA MARIA DELLA SCALA BETWEEN SCIENTIFIC KNOWLEDGE AND MAGICAL THOUGHT

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(Received 12 October 2017, revised 3 November 2017)

Abstract

In this study we present the first physicochemical study of 231 drugs preserved in the main show-case at the 'Spezieria di Santa Maria della Scala' (Rome), a conventual pharmacy founded in the late seventeenth century by the Order of the Discalced Carmelites. This pharmacy is therefore associated with the religious order of Spanish origin that at that time controlled trade with both the East and the West Indies. We assumed 'a priori' that the drugs preserved in the pharmacy could exemplify the amalgam of learning that made up pharmaceutical knowledge in Early Modern Europe, which is of interest to the History of Science. In order to identify the composition of these drugs, we used a multi-analytical approach by the combined use of optical microscopy, X-ray fluorescence spectroscopy, FTIR, X-ray diffraction and gas chromatography coupled with mass spectrometer. Our results so far have enabled us to make an initial historical and cultural analysis of the drugs that were prepared by the Carmelite friars at this conventual pharmacy in Baroque Rome. One of the most interesting conclusions from this study is that a lot of identified substances had both artistic and medicinal use.

Keywords: pigments, physicochemical analysis, historical study, cultural, significances

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1. The 'Spezieria di Santa Maria della Scala'

At the end of the seventeenth century there were many conventual pharmacies in Rome. However, only four of them had gained the trust of royalty, of the nobility and of the high clergy. These were the *Spezieria dei Gesuiti del Collegio Romano*, the *Spezieria de 'Ara Coeli'*, the *Spezieria dei Fatebenefratelli* on Tiber Island, and the *Spezieria di Santa Maria della Scala*, which is the focus of this research. These religious pharmacies were also attended by the more humble sectors of Roman society because they could obtain medicines even free or more cheaply than they obtained from secular apothecaries. In fact, secular apothecaries had to pay high taxes, so the prices of their drugs and other medicinal products were higher [1]. Taxes were established by the *Nobile Collegio Chimico Farmaceutico di Roma*, founded on March the 8th, 1429. The *Nobile Collegio* aimed to regulate all matters pertaining to: manufacture, sale, prices and fees of products prepared and dispensed by secular apothecaries; registration fees and examinations for the commencement of pharmaceutical practice; prohibitions to open new pharmacies in Rome, which were exempted from paying the above taxes and other financial and legislative fees set by the *Nobile Collegio Chimico Farmaceutico di Roma* for secular pharmacies [2].

Conventual pharmacies were also not obliged to observe the *Antidotarium romanum* which, according to the secular apothecaries, detracted from the quality and safety of the medicines they prepared and dispensed. This explains the decrees and edicts, issued during the seventeenth and eighteenth centuries, to prevent conventual pharmacies from publicly selling the drugs they prepared. Some of the most important decrees and edicts were that issued by Pope Innocent XIII in 1722 to prohibit Roman religious orders from selling any medicines except theriac and apoplectic balsam [2], and the Edict of Pope Clement XII, issued in 1735. Other decrees were subsequently published, but they were unable to force the closure of the conventual pharmacies, and several even survived until the beginning of the twentieth century. One example is the *Spezieria di Santa Maria della Scala*, founded by the Spanish Order of the Discalced Carmelites. In 1829, during the papacy of Pius VIII, this conventual pharmacy had the privilege to supply drugs for the Pontiff, his family, and the Swiss Guard [3], a function that continued under the papacy of Gregory XVI, who in 1838 ratified the pharmacy's privileges [2, p. 263]. Due to this privilege, the *Spezieria di Santa Maria della Scala* maintained it's a good reputation until 1950 when it stopped the activity and the opening to public [3].

At the beginning, the *Spezieria di Santa Maria della Scala* owned the *orto medicinalis*, where the Carmelite friars cultivated many of the vegetal species (*simple*) they used to prepare *compound* drugs, for which they also used other types of substances which were not necessarily of autochthonous origin. This operating modality reproduced the *modus operandi* of the Carmelite monasteries of the Middle Ages, when the order earned recognition around Europe for its excellent work in the preparation and sale of medicines.

Other notable areas of the *Spezieria di Santa Maria della Scala* were the galenic laboratory, known as the *liquorificio*, where liquors and perfumes were distilled, and of course the public sales room, which today displays numerous cabinets and show-cases full of jars still containing traces of the original *simple* and *compound* drugs (Figure 1). In this large room a ceiling mural can also be observed with numerous flowers such as the poppy (*Papaver somniferum L.*). This mural composes a framework of enormous beauty, full of symbolic content. Initial iconographic analysis of the floral species depicted in the mural suggested a close relationship between these flowers and the prescriptions used by the Carmelite monks to prepare the drugs. A large one-metre-tall ceramic container, used for storing theriac, dominates on side of the room. Theriac was a complex compound, reputed as a universal antidote since ancient time [4]. Another smaller container that still bears the remains of another resinous/aromatic product with healing properties can be seen close to the large one.

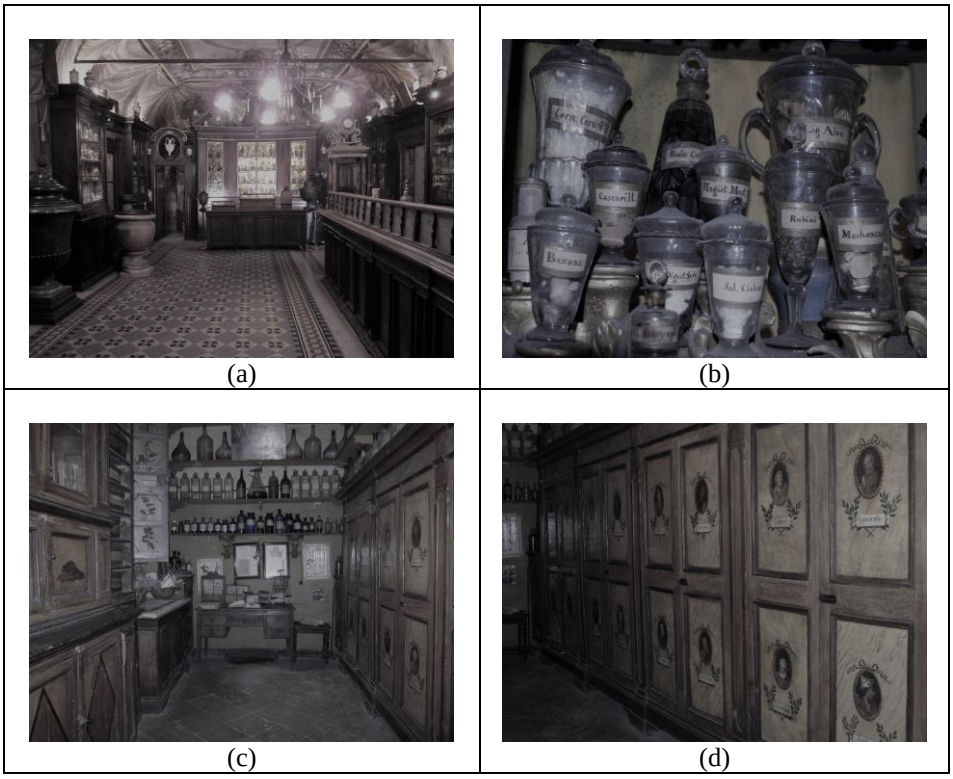

Figure 1. (a) Sale room of the *Spezieria di Santa Maria della Scala*, (b) Close-up of the jars preserved in the main vitrine housed in the sale room, (c) Office, (d) Close-up of the cupboards containing the boxes of simple drugs.

A door on one side of this room leads to the office, which houses large wooden cupboards that were used to store the boxes of simple drugs. The doors of these ample cupboards are decorated with images of great doctors and historians (such as Dioscorides, Hippocrates, Galen, Avicenna and Paracelsus),

whose treatises described the properties and uses of these simple medicines. These representations on the cupboards, therefore, evoke the greatest exponents of Middle Eastern Islamic and western Mediterranean medicine. This comes as no surprise since, between the seventeenth and eighteenth centuries, the religious order to which this conventual pharmacy belonged exercised the greatest control over the trade routes to both the Far East and the New World. The Carmelite friars of *Santa Maria della Scala* therefore had access to vegetal substances and mineral resources that encouraged a certain 'reinterpretation' of the science of Paracelsus. This is fully consistent with the occurrences in the field of European medical/pharmaceutical science after the late sixteenth century when new products began to arrive from the recently discovered America – as it is documented in the most prestigious monographs on professional practice produced after the end of the 16th century. In Italy these include the *Fiorentino Ricetario* of 1498, the *Farmacopea di Mantova* of 1559, the *Antidotario di Bologna* of 1574, the *PharmacopoeiaBergami* of 1580, the *Farmacopea Romana* of 1583, the *Farmacopea Ferrarense* of 1595, the *Farmacopea di Venezia* of 1617, the *Antidotario Romano* of 1629, the *Farmacopea di Milano* of 1668, the *Farmacopea di Bologna* of 1641 and other documents such as the nineteenth-century *Codice farmaceutico per lo Stato della Serenisima Repubblica di Venezia* (Padova 1790), the *Codex Medicamentariux Parmensis* of 1822, and the *Farmacopea Napolitana* of 1859 [2].

This amalgam of knowledge amassed at the *Spezieria di Santa Maria della Scala* – located halfway between the ancient western Mediterranean and the Middle East (Islamic medicine) and halfway between the Far East (India) and the New World (pre-Hispanic knowledge) – as well as the work of Paracelsus – the bridge between the legacy bequeathed by Hippocrates and Galen and a new pharmaceutical practice whose alchemical base laid the foundations for modern chemistry – encouraged us to propose a first research project in this cultural melting pot of Baroque Rome. The name of this first research project was *Tracing back to Antiquity the composition and significance of ancient drugs, pigments and fragrances found in a 17th century Roman pharmacy: the archaeometric characterization and historical-cultural study of an overlooked collection* (Universidad de Valencia, 2014-2016), which led to our current study, entitled *Antichi minerali nell'arte degli speziali di 'Medicamentaria Officina' di Santa Maria della Scala, Roma. Indagini Chimico-Fisiche e Studio Storico-Culturale* (Aboca Museum, 2017-2018). In both studies, we established a physical-chemical analysis protocol in accordance with the set objectives.

2. Goals and methodology

The purpose of these two projects was to: (a) develop the archaeometric study of the drugs, pigments and fragrances preserved at the *Spezieria di Santa Maria della Scala*; and (b) develop the historical, cultural and symbolical-medicinal interpretation and meaning of these products, tracing their projection

from Antiquity to the Early Modern Era. In order to reach these purposes we needed to satisfy several intermediate objectives, including setting the products in their ancient context (the Greco-Roman world, Pre-Hispanic America, and ancient India and the Far East), placing them in their context of use (seventeenth and eighteenth-century Italy and Europe), and projecting them into the modern world while filtering them through the prism of the culture, society, scientific and medical knowledge and belief system extant in each case.

The applied analytical techniques were: optical microscopy (LM), XRF, FTIR, SEM/EDXS, X-ray powder diffraction (XRPD), and gas chromatography/mass spectrometry (GC/MS). The use of these analytical techniques has been possible thanks to the collaboration between several European universities and research centres in France, Italy, Spain and Switzerland.

The obtained results have been studied in a first phase with the help of written and visual historical sources, some of which are conserved at the *Spezieria di Santa Maria della Scala*. The pharmacy holds treatises on Medicine and pharmacopoeias that were in use in the seventeenth and eighteenth centuries. The collection includes late editions of Greek and Roman treatises, such as those of Hippocrates, Dioscorides and Galen, and other transition authors between the Middle Age and the Early Modern Era, such as Mesué and Paracelsus. The pharmacy also holds herbal manuscripts that were produced by the Carmelite friars, as well as accounts books and sales registers that show the products dispatched, their composition (in some cases only), the names of clients, and prices. The *Spezieria di Santa Maria della Scala* also contains many iconographic sources relevant to this project and which were considered in this first phase of our historical study.

3. Results and discussion

As first result, it was found that seven groups of drugs were stored in the *Spezieria di Santa Maria della Scala*: (1) the complex formulations, (2) drugs prepared with mercury, (3) drugs prepared with antimony, (4) drugs prepared with iron, (5) organic compounds, (6) salts used for medicinal purposes and (7) gems (Table 1).

The most abundant group is number 6 (salts). Over half of the studied drugs at *Santa Maria della Scala* consist in salty materials, having different names. However, preliminary FTIR and XRPD analyses showed that their compositions are practically the same: i.e. mainly the potassium sulphate arcanite with formula K_2SO_4 (Figures 2 and 3). Some of them may have pleasant smell, such as *Sal Tanasell*, *Sal Anonid*, *Sal Scabios* and *Sal Apet*. It appears that the salts may also have been used as components for other drugs, including complex formulations. Therefore salts may be considered the main component in the preparation of many drugs at *Santa Maria della Scala*. It is also interesting to note that, according to seventeenth and eighteenth-century written sources, such

as *Farmacopea ad uso dei poveri* (1794), the salts were used extensively to cure the diseases of the poor [5-8].

Table 1. Drugs preserved in the most ancient containers.

Group	Compounds	The most abundant drugs conserved for each group
Group 1	Complex formulations	Antym Diaphor, Trocisc. Alb. Rax., Pietra divina, Mutriforte Palay, Granat P.P., Anthiemet. P.P
Group 2	Mercury	Princip. Alb., Precip. Rub., Marcas. Arg. Grc., Mercurio Solub. del Mosc., Protossido di Piombo, Cinabr. Nativ., Cinabr. Fact., Pulv. Absorbent Ven.
Group 3	Antimony	Sulph. Aur Antym., Antym Diaphor., Antymon. Diaphor Mart., Sulph Aurat Antim., Stomat. Poter, Anthiemet. P.P, Kerm. Minerv: Pro Veter, Reg. di Antimonio.
Group 4	Iron	Pulv. adcas. Mesne, Magist. Mart A.A., Pulv. Cahet. Arnol, Lapis. Castrac, Antymon. Diaphor Mart., Bol Armen, Ossido di Megane, Terr. Lemn., Pulv. Astringent, Magist. Mart. Ap., Lap. Hematit. PP.
Group 5	Organic compounds	Tint. di Cascarilla, Cascaril, Estratto di Cocca, Gumin. Kui?, Resin Mechioar, Mirabol Citrin, Gran Paradis, Lans. Fel. Rubr., Benzoin, Gumm. Gut, Mechoacan, Gumm. Dragant, Corn. Cerv. PR., Lig. Aloe, Res Guajac, Viper Pulv., Sarcocoll, Anis Stellat, Guaiaco Resin., Oss. Cord. Cerv., Balsam. Peruvin, Ladon, Resin Scamon.
Group 6	Salts	Sal Vener, Sal Pimpinell, Sal Corall, Sal Guajac, Sal Escorz Ner, Sal Beccabung, Sal Hyosciam, Sal Peon, Sal Ormin, Sal Juvartel, Sal Eliotrop, Sal Juvartel, Sal Asparag, Sal Caryoph, Sal Dictam Cret., Sal Polychr, Sal Absynt, Sal Centaur, Sal Tanasell, Sal Tartar Solub., Sal Anonid, Sal Capill Vener, Sal Agrimon, Sal Rest. Capr., Sal Scabios, Sal Apet., Sal Goniz, Sal Fenaot, Sal Junyp, Sal Carlin, Sal Androsdem, Sal Tartar F., Sal Chichor, Sal Balsamin, Sal Achant, Sal. Digest. Sylv., Sal Anet, Sal Mirabit, Sal Aquileg, Sal Cyan, Sal Barden, Sal Corocop, Sal Hyperic, Sal Lentise, Sal Chin, Sal Theriacal.
Group 7	Gems	Margarit, Hyacint, Granat, Smerald, Pietre Preziose, Rubin, Saphyr, Topat, Lapislazuli.

The investigation of these salts through LM allowed identifying very different appearances (Figure 4). This result is extremely interesting because in pharmaceutical science it is known that a modification in a compound can lead to new properties and/or functions. In other words, the potassium sulphate that seems to identify all salts at the *Spezieria di Santa Maria della Scala*, may have had different medicinal applications depending on possible modifications. This would explain the different names for these salts on the labels of the bottles. However, this hypothesis needs to be studied later as part of our project.

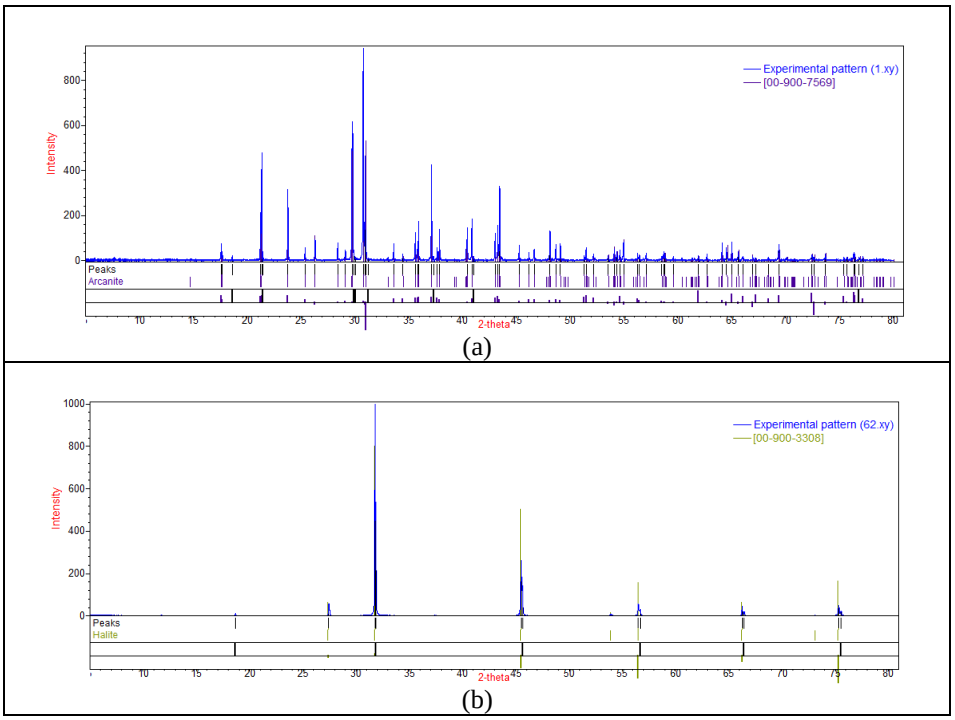

Figure 2. X-ray powder diffraction profiles of the salts: (a) *Sal Vener* Arcanite (K_2SO_4) and (b) *Sal Apet* Halite (NaCl).

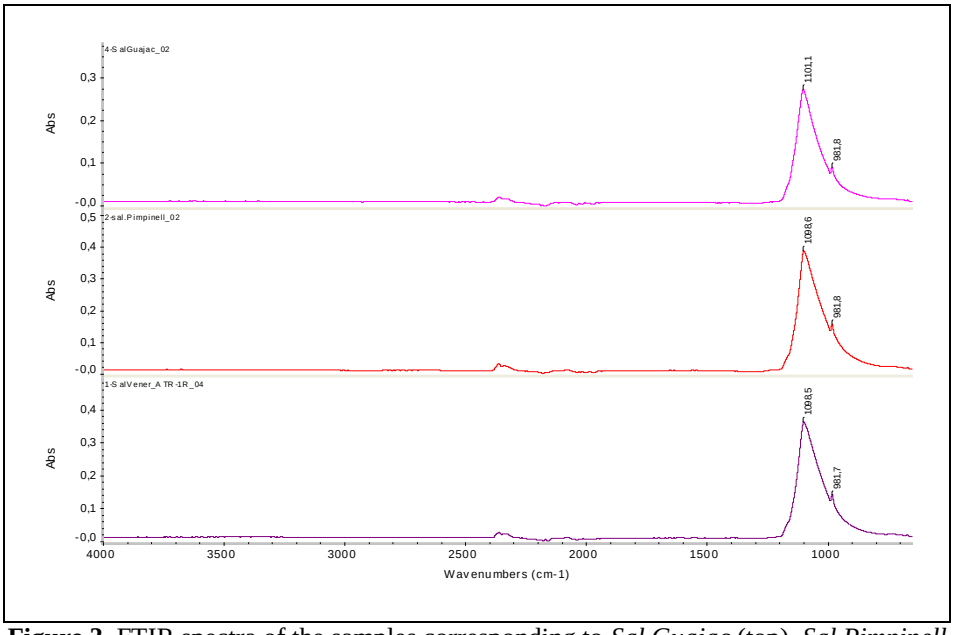

Figure 3. FTIR spectra of the samples corresponding to *Sal Guajac* (top), *Sal Pimpinell* (middle) and *Sal Vener* (bottom). Although the flasks storing the salts were labelled under different names, they contained the same compound as identified in the three infrared spectra, which all correspond to potassium sulphate.

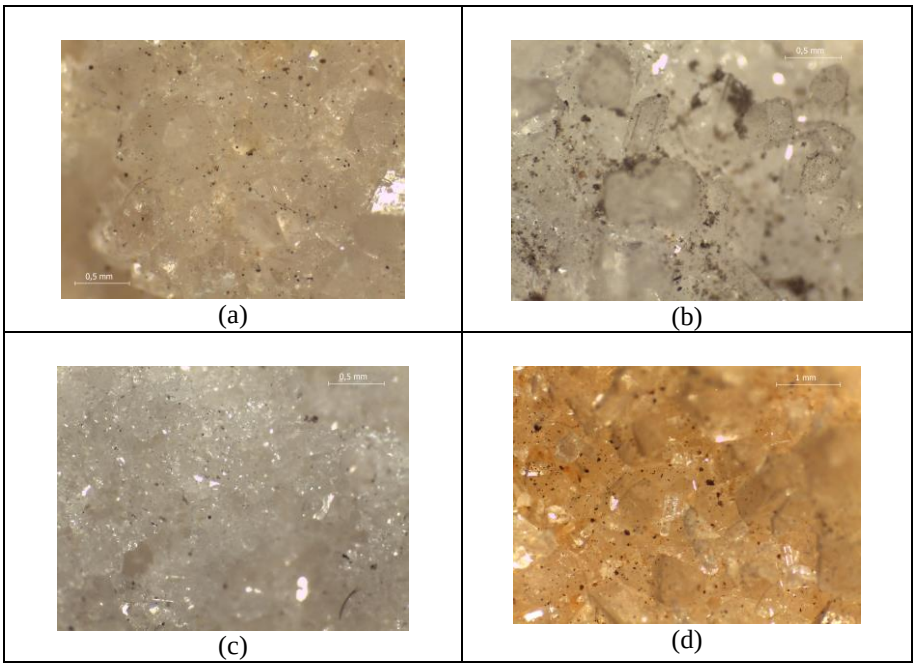

Figure 4. LM microphotographs of: (a) Sal Guajac, (b) Sal Pimpinell, (c) Sal Vener, and (d) Sal Aquileg. Note how the appearance of these salts is not the same even though they have the same chemical composition, i.e. potassium sulphate.

Iron, mercury and antimony have been used in medicine since Antiquity [8] and they were widely applied in the medicine of the Middle Age and the Early Modern Era. Colour, temperature and texture were optical qualities that enhanced their healing properties. For example, from Hippocrates and Galen to the pharmacopoeia employed at *Santa Maria della Scala*, hematite (α-Fe_2O_3) is a red iron oxide often used to treat menstrual headaches and other diseases related to blood imbalances. Also, the ancient relationship between iron (Mars), mercury (Mercury) and antimony (Saturn) on one hand and the planets on the other also conferred each of them with highly important healing properties in the Middle Age and the Early Modern Era. The same occurred in the case of gems.

In their simple version, many of these drugs were pigments and colouring matter that have been widely used for artistic purposes since Antiquity. It is not surprising that the cupboards storing these simple drugs were known in the Middle Age as the *Armarium* [2, p. 262]. It should also be remembered that the inventories of apothecaries during Early Modern Europe contain the inscription *Pigmenta et Colores*, which lists the products. It provides other invaluable data for scholars interested in colour and drugs, such as costs or diffusion in each era. One example is the 1589 Kolberg inventory list of the Ratsapotheke, which divided simple and compound drugs into two groups; the first listed the colouring matters using inscriptions such as *Mineralia*, *Metalla* and *Lapides* [9]. The development of these pigments and colouring matter has been studied in important projects such as the Munich Taxae Project [9]. This drug-pigment

duality dates back to much more ancient times. For example, simple drugs such as Lemnian Earth, which was found in traces at the *Spezieria di Santa Maria della Scala*, alluded to the sacred drug-pigment prepared for commercialization by the priestesses of the goddess Diana every year at her sanctuary on the Island of Lemnos [10]. The medicinal, pictorial and ritual uses of this substance are attested by both Pliny the Elder and Galen in their respective treatises. In the case of Lemnian Earth it is interesting to note, given the association of epilepsy with the Moon and therefore with Artemisa-Diana, that in Antiquity this drug was prescribed to treat epilepsy (which the Corpus Hippocraticus refers to as the 'sacred illness').

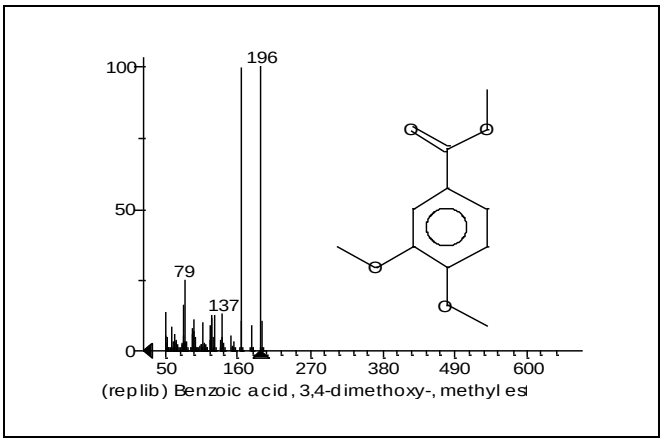

Figure 5. Mass spectrum of a benzoic acid derivative identified in 119 and 193 samples of the *Spezieria di Santa Maria della Scala* by GC-MS. In both cases the samples correspond to a guayacil-based Resin.

Finally, organic compounds (and especially plants) received special attention from the friars to prepare prescriptions at *Spezieria di Santa Maria della Scala* in accordance with the most important pharmacopoeias from the post-Constantine period, such as *Antidotarium Nicolai*. This had a great impact on Italian medieval and modern pharmacopoeias through the School of Salerno, where Arabic medicine (e.g. Bezoar) met Mediterranean (e.g. Lemnian Earth). At *Santa Maria della Scala* there is evidence of both. However, there is also evidence of the use, in seventeenth and eighteenth-century medical practice, of organic substances from the New World (e.g. Mechoacan and Guaiaco Resin) and from India (e.g. Gumin Kui). Several organic compounds that identify these vegetal species of foreign origin have recently been identified by GC-MS (Figure 5). This proves the amalgam of knowledge between East and West that came together at this Carmelite pharmacy of Baroque Rome.

4. Conclusion

The first results from this research provided a wide panoramic view of the pharmaceutical practice employed at *Santa Maria della Scala* from the

seventeen century onwards. However, they also revealed the importance of continuing this study with the aim: (a) to conclude the analysis for characterising organic and inorganic substances in the complex formulations, and (b) to conduct thorough historical research using prescription manuals (including beautifully decorated herbal manuscripts) and many of the handwritten letters, magisterial formulas, invoices, prescriptions, etc. that are conserved at *Santa Maria della Scala*. All this unpublished documentation requires detailed study, as does the bulk of the documentation from the pharmacy's archives that are now held at the National Library in Rome. While the written and visual historical sources kept at *Santa Maria della Scala* have so far never been studied, they probably contain numerous keys to better understanding the amalgam of pharmaceutical knowledge that exists in this ancient laboratory.

Acknowledgment

This research was possible thanks to the support of the Aboca S.p.A. Società Agricola (Sansepolcro, Italy), through funding of the Project: Antichi minerali nell'arte degli speziali di 'De medicamentaria officina' di Santa Maria della Scala, Roma. Indagini chimico-fisiche e studio storico-culturale (2017-2018).

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