

**TRADITION AND RENOVATION IN THE ANCIENT
DRUGS OF THE *SPEZIERIA DI SANTA MARIA DELLA
SCALA (ROME)*.
BETWEEN SCIENTIFIC KNOWLEDGE AND
MAGICAL THOUGHT**

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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 at 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

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Science. To identify the composition of these drugs, we used a multianalytical approach by the joint use of optical microscopy (LM), X-Ray Fluorescence (XRF), Fourier Transform Infrared Spectroscopy (FTIR), X-Ray Diffraction (XRD) and, more recently, Gas Chromatography-Mass Spectrometry (GC-MS).

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 initial study is that many of the substances that have been identified performed a dual artistic-medicinal function.

Keywords: *Spezieria di Santa Maria della Scala*, Rome, drugs, pigments, physicochemical analysis, historical study, cultural significances.

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, the nobility and 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 establishments were also attended by the more humble sectors of Roman society since there they could obtain medicines more cheaply than they could from secular apothecaries, or even obtain them for free. To exercise their profession, owners of these secular apothecaries had to pay high taxes, so the prices of their drugs and other medicinal products were higher [1]. The taxes were set by the *Nobile Collegio Chimico Farmaceutico di Roma*, founded on 8th March, 1429, which aimed to regulate all matters pertaining to: the manufacture, sale, prices and fees of products prepared and dispensed by secular apothecaries; registration fees and examinations for the commencement of pharmaceutical practice; prohibitions on opening 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 that were 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 the Decree of 1722 issued by Pope Innocent XIII 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 followed but they were unable to force the closure of the conventual pharmacies, and several even survived until the beginning of the twentieth century. One such example is the

Spezieria di Santa Maria della Scala, which was founded by the Spanish Order of the Discalced Carmelites. In 1829, during the papacy of Pius VIII, this conventual pharmacy had the privilege of being chosen to supply drugs for the Pontiff, his family, and the Swiss Guard [3], a function it continued to perform under the papacy of Gregory XVI, who in 1838 ratified the pharmacy's privileges [2]. This distinguished precedent established its good reputation and the esteem in which it was held until 1950 when it finally closed its doors to the public [3].

In 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 that were not necessarily of autochthonous origin. This form of operating 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 *simple* and *compound* drugs that were stored in them (Figure 1). Also found in this large room is a ceiling mural in which numerous flowers such as the poppy (*Papaver somniferum L.*) compose a framework of enormous beauty full of symbolic content. Initial iconographic analysis of the floral species depicted in the mural suggests that there was a close relationship between many of these flowers and the prescriptions manual used by the Carmelite monks to prepare the drugs they dispensed there. Dominating one side of this room is a large one-metre-tall ceramic container that was used to store theriac. Next to this is a smaller container that still bears the remains of another resinous/aromatic product with healing properties.

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 on the outside with images of great doctors and historians (such as Dioscorides, Hippocrates, Galen, Avicenna and Paracelsus), in whose treatises the properties and uses of these simple medicines were described. By representing on these cupboards the main exponents of Middle Eastern Islamic and western Mediterranean medicine, the pharmaceutical/medicinal knowledge of both traditions were merged in a prelude (prior to any physical or chemical analyses) to the wealth of curative knowledge that was amassed at the *Spezieria di Santa Maria della Scala*, much of which, as we will see later, dates back a thousand years. 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. Of course, this is fully consistent with what generally occurred in the field of European medical/pharmaceutical science after the late sixteenth century

when new products began to arrive from a recently discovered America – as is documented in the most prestigious monographs on professional practice that were 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 *Pharmacopoeia Bergami* of 1580, the *Farmacopea Romana* of 1583, the *Farmacopea Ferrarese* 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 Serenissima Repubblica di Venezia* (Padova 1790), the *Codex Medicamentarius Parmensis* of 1822, and the *Farmacopea Napolitana* of 1859 [2].

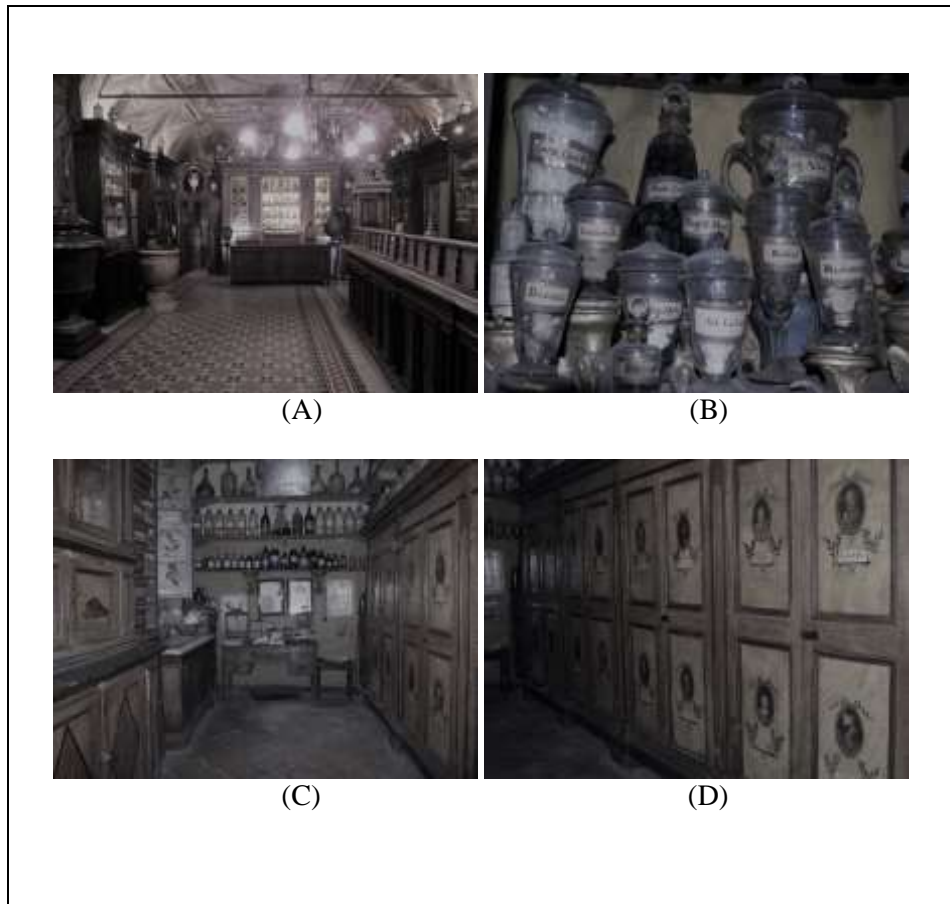


Figure 1 (A) Sales room of the *Spezieria di Santa Maria della Scala*. (B) Close-up of the jars preserved in the main vitrine housed in the sales room. (C) Office. (D) Close-up of the cupboards that contained the boxes of simple drugs.

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 has led to our current study, entitled *Antichi minerali nell'arte degli speciali 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 objectives set.

2. Goals and methodology

The purpose of these two projects was therefore 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. To do so, we aimed to fulfil 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 analytical techniques we used were: optical microscopy (LM), X-Ray Fluorescence Spectroscopy (XRF), Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy-Electron Dispersive X-Ray Spectroscopy (SEM/EDXS), X-Ray Powder Diffraction (XRPD), and Gas Chromatography/Mass Spectrometry (GC/MS). The use of all 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

Our first results reveal that there were seven groups of drugs at the *Spezieria di Santa Maria della Scala*: the complex formulations (1), drugs prepared with mercury (2), drugs prepared with antimony (3), drugs prepared with iron (4), organic compounds (5), salts used for medicinal purposes (6), and gems (7) (see Table 1).

Table 1. Drugs preserved in the most ancient containers

GROUP	COMPOUNDS	THE MOST ABUNDANT DRUGS CONSERVED FOR EACH GROUP
Group 1	<i>Complex formulations</i>	Antym Diaphor; Trocisc. Alb. Rax.; Pietra divina; Mutriforte Palay; Granat P.P.; Anthiemet. P.P
Group 2	Mercury	Princip. Alb.; Precip. Rub.; Marcas. Arg. Gr.; 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. Peruvini; 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 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 show that their compositions are practically the same: i.e. mainly the potassium sulphate arcanite with formula K_2SO_4 (Figures 2-3). Some of them may have aromatic properties, 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, in one way or another, the 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 [4-7]. By using LM to study these salts we were able to identify very different appearances with respect to the same mineralogical structure identified through FTIR and XRPD (see Figure 4). This 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.

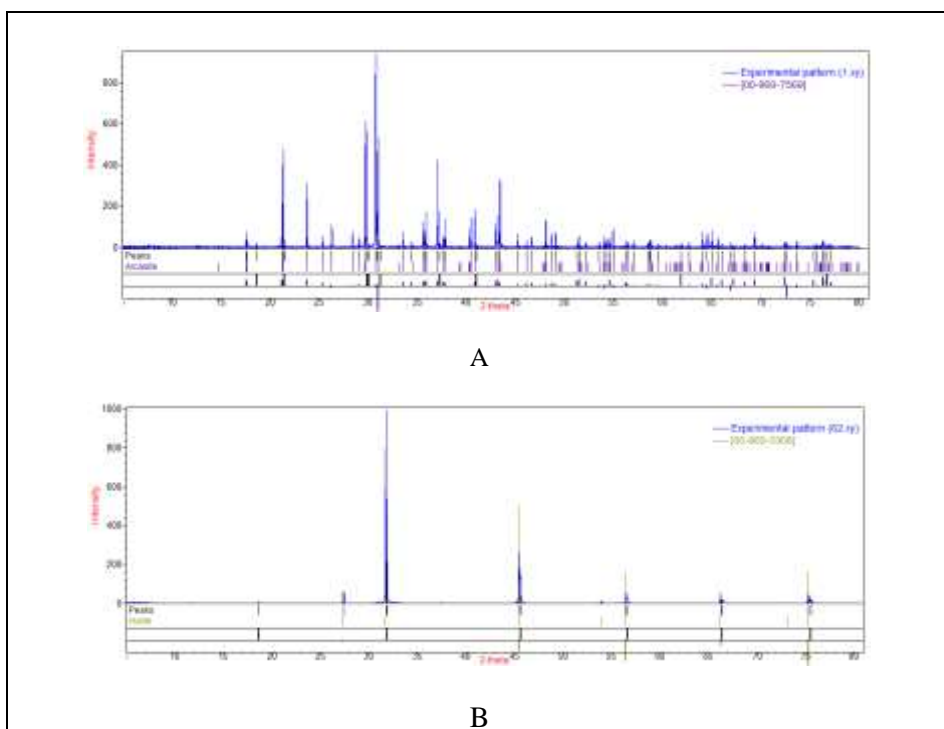


Figure 2. X-ray Powder Diffraction (XRPD) profiles of the salts (A) *Sal Vener* Arcanite (K_2SO_4) and (B) *Sal Apet* Halite ($NaCl$)

Iron, mercury and antimony have been used in medicine since Antiquity [7] and 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 ($\alpha\text{-Fe}_2\text{O}_3$) 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 the 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 in which these simple drugs were stored were known in the Middle Age as the *Armarium* [2]. We should also remember that the inventories of apothecaries of Early Modern Europe contain the inscription *Pigmenta et Colores*, which lists the products and provides other invaluable data for scholars of the history of colour and drugs, such as how much they cost or how much was dispensed in each era. One such example is the Kolberg inventory list of the Ratsapotheke of 1589, which divided simple and compound drugs into two groups, the first of which listed the colouring matters using inscriptions such as *Mineralia*, *Metalla* and *Lapides* [8]. The development of these pigments and colouring matter has been studied in such important projects for our topic as the Munich Taxae Project [8]. This drug-pigment duality that was shared by many simple drugs in the Middle Age and Early Modern Age dates back to much more ancient times. Simple drugs such as Lemnian Earth, for example, traces of which remain at the *Spezieria di Santa Maria della Scala*, allude to the sacred drug-pigment that was prepared for commercialization by the priestesses of the goddess Diana every year at her sanctuary on the Island of Lemnos [9]. The medicinal, pictorial and ritual uses of this substance are attested to 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’).

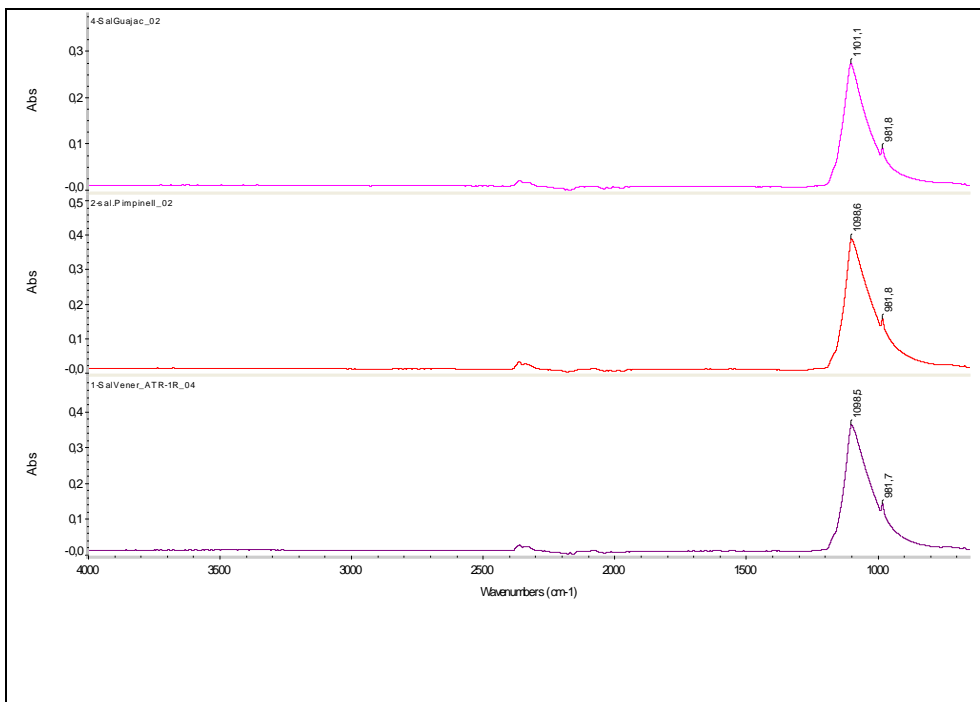


Figure 3. FTIR spectra of the samples corresponding to *Sal Guajac* (top), *Sal Pimpinell* (middle) and *Sal Vener* (bottom). Although the flask in which each salt was stored was labelled under a different name, all three spectra have the same profile, which corresponds to potassium sulphate.

Finally, organic compounds (and especially plants) received special attention from the friars for preparing 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 (see Figure 5). This proves the amalgam of knowledge between East and West that came together at this Carmelite pharmacy of Baroque Rome.

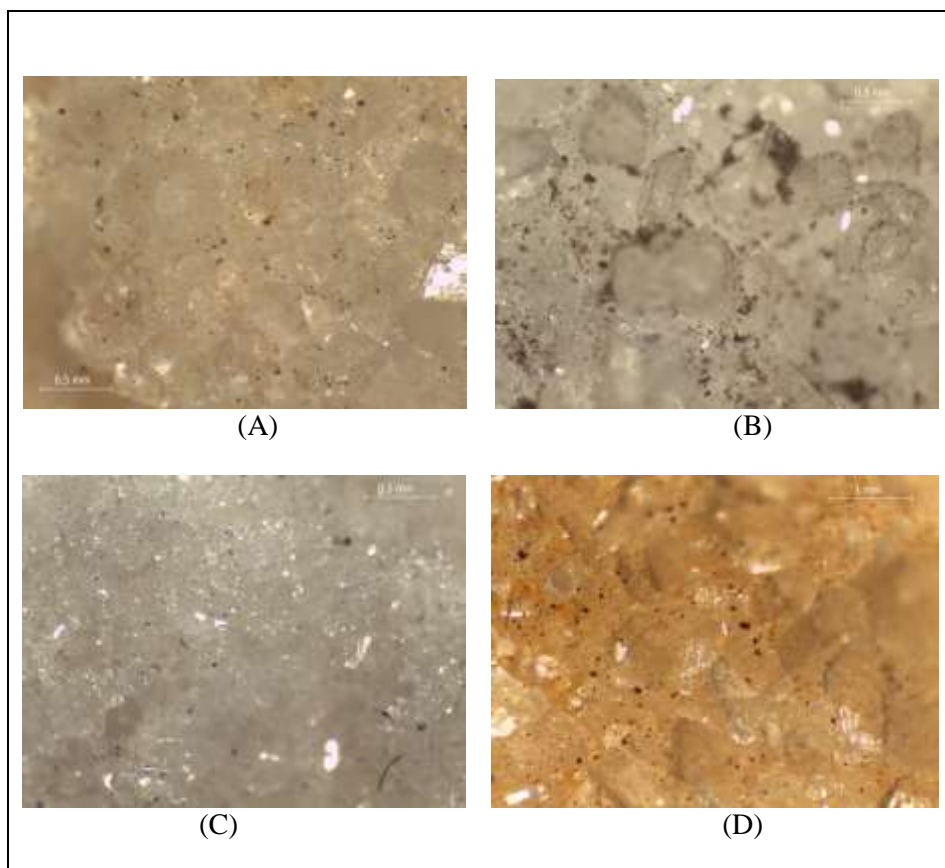


Figure 4 LM of (A) Sal Guajac, (B) Sal Pimpinell, (C) Sal Vener, and (D) Sal Aquileg. Note how the structures of these salts are not the same even though they all have the same composition, i.e. potassium sulphate.

4. Conclusions

The first results from this research study provide a wide panoramic view of the pharmaceutical practice employed at *Santa Maria della Scala* from the seventeenth century onwards. However, they also reveal the importance of continuing this study: (a) to conclude the organic and inorganic physicochemical analyses and identify complex formulations and other recipes, 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 at this ancient laboratory.

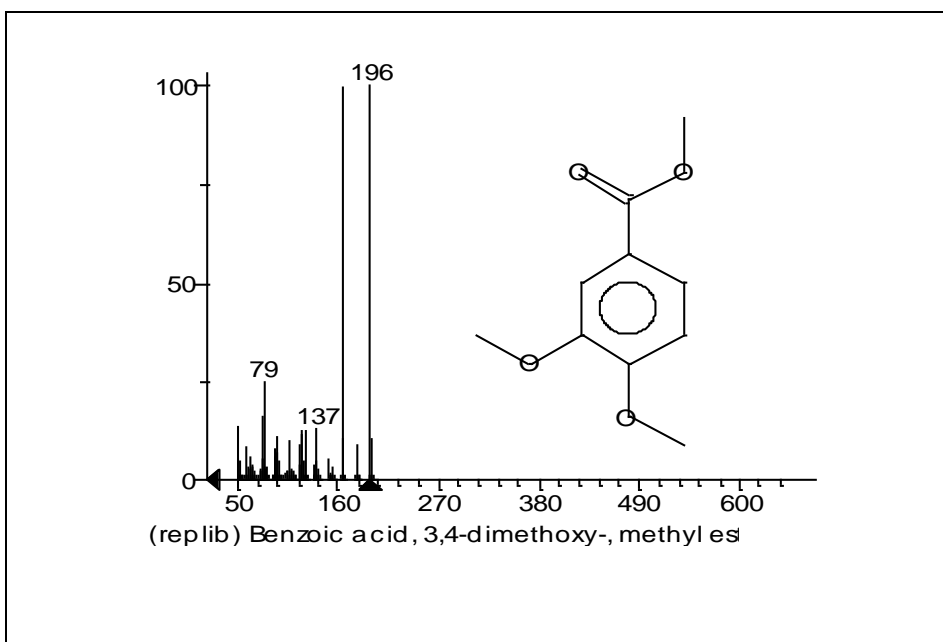


Figure 5. Mass spectrum of a Benzoic acid derivative identified in 119 and 193 of the *Spezieria di Santa Maria della Scala* identified by GC-MS. In both cases the samples correspond to Guajac Resin.

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