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HISTORIA Y MEDICINA

On New Spain and Mexican medicinal botany in cardiology

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ABSTRACT

Towards the middle of the XVI century, the empirical physician Martín de la Cruz, in New Spain, compiled a catalogue of the local medicinal herbs and plants, which was translated into Latin by Juan Badiano, professor at the Franciscan college of Tlatelolco. On his side, Dr. Francisco Hernández, the royal physician (protomédico) from 1571 until 1577, performed a systematic study of the flora and fauna in this period. His notes and designs were not published at that time, but two epitomes of Hernández' works appeared, respectively, in 1615 in Mexico and in 1651 in Rome. During the XVIII century, two Spanish scientific expeditions arrived to these lands. They were led, respectively, by the Spanish naturalist Martín Sessé and the Italian seaman, Alessandro Malaspina di Mulazzo, dependent from the Spanish Government. These expeditions collected and carried rich scientific material to Spain. At the end of that century, the Franciscan friar Juan Navarro depicted and described several Mexican medicinal plants in the fifth volume of his botanic work. In the last years of the colonial period, the fundamental works of Humboldt and Bonpland on the geographic distribution of the American plants were published. In the modern age, the first research about the Mexican medicinal botany was performed in the laboratory of the Instituto Médico Nacional [National Medical Institute] under the leadership of Dr. Fernando Altamirano, who started pharmacological studies in this country. Later, trials of cardiovascular pharmacology were performed in the small laboratories of the cardiological unit at the General Hospital of Mexico City, on Dr. Ignacio Chávez' initiative. The Mexican botanical-pharmacological tradition persists alive and vigorous at the Instituto Nacional de Cardiología and other scientific institutions of the country.

Key words. New Spain herbaria. New Spain botanical textbooks. Mexican medicinal plants.

En torno a la botánica medicinal novohispana y mexicana en cardiología

RESUMEN

A mediados del siglo XVI el médico empírico novohispano Martín de la Cruz recopiló un catálogo de hierbas medicinales locales, cuyo texto original, en náhuatl, fue traducido al latín por Juan Badiano, profesor en el colegio Franciscano de Tlatelolco. Años después, el doctor Francisco Hernández, protomédico de la Nueva España en el periodo 1571-1577, efectuó un estudio sistematizado de la flora y la fauna mexicanas. Los apuntes y dibujos por él reunidos a lo largo de aquellos años no llegaron a publicarse en su tiempo. Pero sendos epítomes de la obra hernandina fueron publicados, respectivamente, en 1615 en México y en 1651 en Roma. En el siglo XVIII, llegaron a tierras novohispanas dos expediciones científicas españolas dirigidas, respectivamente, por el naturalista Martín Sessé y por Alessandro Malaspina di Mulazzo, marino italiano al servicio del gobierno de España. Los expedicionarios recogieron un valioso material científico que en su mayor parte se trasladó a Madrid. A finales de dicho siglo, el español fray Juan Navarro O.F.M. dibujó y describió numerosas plantas medicinales novohispanas en el quinto tomo de su obra botánica. En las postrimerías de la época colonial salieron a la luz dos obras fundamentales de Humboldt y Bonpland acerca de la distribución geográfica de las plantas americanas. En la época moderna, las primeras investigaciones concernientes a la botánica medicinal mexicana se realizaron en el laboratorio del Instituto Médico Nacional, bajo la guía del doctor Fernando Altamirano, iniciador de estudios farmacológicos en México. Años después, ensayos de farmacología cardiológica se efectuaron en los pequeños laboratorios anexos al pabellón de cardiología del Hospital General de la capital de la República, por iniciativa del doctor Ignacio Chávez, y se continuaron en el Instituto Nacional de Cardiología de México y en otras instituciones científicas del país.

Palabras clave. *Herbolaria medicinal novohispana. Textos botánicos en bibliotecas novohispanas. Estudios farmacológicos mexicanos.*

INTRODUCTION

In the XVI century, the herbarium of the indigenous physician Martín de la Cruz (1552),[1] a work called *Codex de la Cruz-Badiano* after both the original author and the translator from Náhuatl to Latin, mentions the *yoloxochitl*[1] (Figure 1). But, it is only ascribed a decongestant effect. Among the other medicinal plants, drawn by the local *tlacuilos* (indigenous people trained to represent pictorially the codices and murals), the *nonochton* (a genus of the *Cacataceae)* can be found, it is recommended against *cordis dolorem*, i.e., against cardiac pain, which, according to some interpreters,[2] could correspond to angina pectoris. The *tlacacamohtlí* herb (fine tubercule) is also depicted; its root is indicated against *cordis calorem.*

It must be considered that this manuscript is actually a recipe book, it is not a pharmacopeia.[3] However, "this Libellus is now the basis to understand the role of the Mexican medicinal plants among the cultures of the past, as well as among contemporary societies".[4,5] On the other hand, several specimens of the flora from New Spain were drawn and described by the Sevillan physician Nicolás Monardes (the original last name was Monardi), based on the accounts of the travelers returning from the New World to their home country. These specimens were included in the botanical treatise by Charles de l'Ecluse (Carolus Clusius).[6]

The first systemized study on the Mexican flora and fauna is due to the valuable efforts of the Spanish physician Francisco Hernández, who remained in Mexican lands from 1571 to 1577 as royal king (protomédico) of New Spain. He mentioned likewise the *yoloxóchitl*, to which he attributed some cardiotonic action: "large tree […] with heart-shaped flowers […] which, mixed with shells of *cacaoatl,* strengthen the heart and stomach [...] and are very much appreciated by the indigenous people." But we do not know how much of the effects were due to those flowers or to the cacao rich in amines.

The notes taken by Hernández, duly pasted into 17 volumes, remained long forgotten in the Escorial Library, where they were destroyed almost completely by the 1671-fire.

Later on, in the XVII century, the Italian physician Antonio Nardo Recco or Recchi, alumnus from the famous Medical School of Salermo, elaborated in Latin an epitome of Hernández' work at the request from the Spanish King himself, Phillip II. This work was printed in Rome, under the sponsorship of the Lincean Academy (Accademia dei Lincei, name in Italian) and saw the light in 1651 under the title *Rerum Medicarum Novae Hispaniae Thesaurus.*[7] The book includes 13 *Tabulae phytosophicae* of the naturalist Federico Cesi, president of that institution. This was the first attempt to classify the vegetables and includes several engravings and comments from European authors. For a long time it was considered the only document known about the multiple research works made by Hernández. However, between 1780 and 1781, Juan Bautista Muñoz, a cosmographer of Indies, discovered in the library of the Imperial College of Madrid (an ex-Jesuit school) a copy of the original text of Hernández. This was trusted to the naturalist Casimiro Gómez Ortega, director of the Botanical Garden of Madrid, who published it in 1790.[8]

Likewise, the Dominican friar, Francisco Ximénez, included an extract of the epitome of Hernández' work in his publication *Quatro libros de la naturaleza y virtudes de las plantas…* [Four books on the nature and virtues of plants…] printed in México without illustrations in 1615.[9] The author declared the following: "[…] I wish to make known the real medicine of this land, being needed so much, since the land is not populated and with many needs for those that live in small communities and mines where no physician or pharmacist exists to seek for a remedy". When he lived in the Oaxtepec Hospital from the Brothers of Charity –a religious Mexican congregation organized by the venerable Bernardino Álvarez–, and also during his stay in the Dominican convent in the capital city of New Spain, Ximénez performed his own research rectifying or corroborating data transmitted by Hernández.

At the beginning of the XVIII century, the book *Florilegio medicinal de todas enfermedades*[10] [Medicinal anthology of all diseases] appeared, which was substantially a manual of medical therapeutics to be used by the missionaries. It was published in 1712 by the Jesuit Juan de Esteyneffer (Steinhöffer), from Silesia.

Towards the middle of the century, while spreading in Europe the beneficial effects of the sociocultural movement known as the *Aufklärung* [Age of Enlightment], the European sovereigns themselves fostered the development and systematization of the natural sciences.

Resembling the *Jardin des plantes* in Paris, established in 1626 by Guy de la Brosse, the Borbon government of Spain promoted the creation of the Botanical Garden of Madrid. Besides, they fostered long exploration and study trips through the vast extension of the Hispanic Empire. Regarding New Spain, expeditions headed, respectively, by the physician and botanist Martín Sessé, and by the Italian

seaman Alessandro Malaspina di Mulazzo at the service of the Spanish government were of great importance. The first explored all the New Spain and gathered a magnificent herbarium that was transported to the Botanical Garden of Madrid in 1820. Other Spaniards collaborated with Sessé: Vicente Cervantes, from the Botanical Garden of Madrid and future professor of botany in México, the naturalists Juan del Castillo and José Longinos Martínez, as well as the pharmacist Jaime Sensseve. These were joined by the Mexicans José Mariano Mociño and José Maldonado. The works of these researchers lasted from 1788 to 1802 covering a wide geographical area, from Nicaragua to the Sea of Cortez. They were the founders of the Royal Botanical Garden of México in 1788 and of the Gabinete de Historia Natural [Natural History Room) of Guatemala. In turn, Vicente Cervantes organized and presided the annual *Ejercicios públicos de botánica* [Public exercise of botany], editing the corresponding texts.[11] Furthermore, apparently, he translated into Spanish the "Elemental Treatise of Chemistry" by A.L. Lavoisier, to be used by the students of the Royal Seminar of Mining (1797).[12] His essay on medical vegetal matter of México, although finished in 1792, was published only until 1889. Mociño, on his side, translated and published the treatise *Elements of Medicine* from the Scottish author John Brown (México, 1803).[13] The *Mexican Flora*, gathered by him, appears in four of the seven volumes of the work *Prodromus systematis naturalis regni vegetabilis* by the Swiss researcher Augustin-Pyramus de Candolle (1824-1839).

Shortly after the arrival of the members of Sessé's expedition, the scientific expedition of Alessandro Malaspina (February 1791)[14] landed in the Port of Acapulco. Two Spanish botanists came in this expedition: Antonio Pineda and Luis Née. A Czech botanist, Tadeo Peregrino Haenke, joined them transiently; he had reached the expeditionaries in Santiago de Chile in April 1790. Because of the retirement of two Spanish drawers, two Italian painters were incorporated: Giovanni Ravenet, from Parma, and Ferdinando Brambilla, from Milan. These, together with the Mexicans José Gutiérrez and Francisco Lindo, were in charge of the graphical documentation. In their voyage from Acapulco to the capital of the Viceroyalty, the companions of Malaspina collected and analyzed a large number of medicinal plants. At the Northwest of La Venta

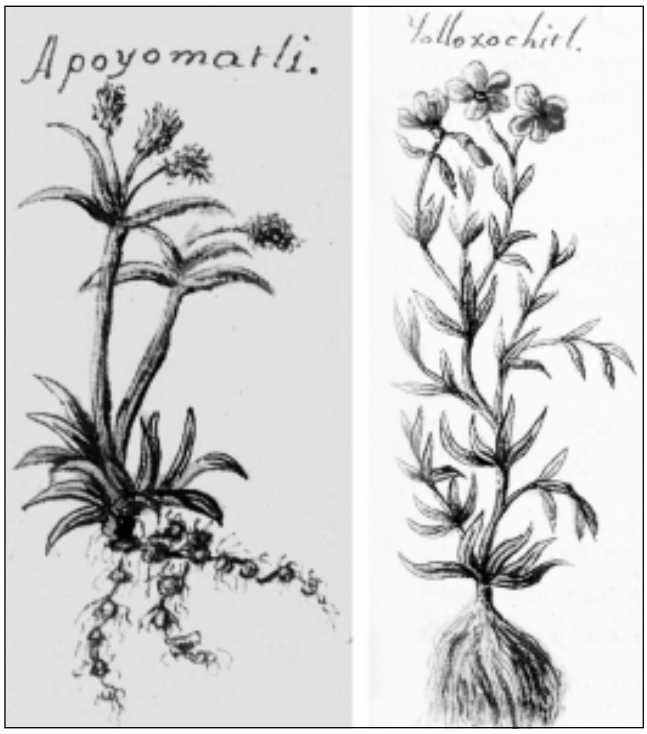

Figure 1. Apoyomatli, phatzi siranda *in Tarascon* (Cyperus articulatus *L). In* Jardín Americano *[American Garden]. F. 178 Yolloxóchitl or chipahuac, i.e., plant to cheer the heart. In* Jardín Americano *[American Garden]. F. 230.*

Figure 2. Mecapatli, i.e., sarsaparilla (Smilax moranensis). *In Codex de la Cruz-Badiano Yoloxochitl (Talauma Mexicana). In Codex de la Cruz-Badiano: 120, Fig. 53 v.*

del Carrizal, they found the *yoloxóchitl*, which they describe as: "Perianth calix of one large tubular piece with 2 or 3 unequal flakes in its base […]".[14]

Towards the end of the XVIII century, the friar Juan Navarro O.F.M., a Franciscan lay brother who had compiled in Europe four volumes of his botanical work, arrived to México to become incorporated into the Colegio Apostólico de la Santa Cruz de Querétaro [College of the Holy Cross of Querétaro]. There, he decided to compile the fifth volume named *Jardín Americano* [American Garden].[15] Herein, he masterly sketched and described briefly some local plants related with the heart, as the already mentioned *yoloxóchitl*. According to the botanical denomination currently proposed by Abigail Aguilar, this plant corresponds to *Talauma mexicana* (D.C.), its flowers were used for the treatment of cardiac discomforts. The mentioned book cites likewise the *Nocheznopalli* or cochineal of Indies, which is born on some prickly pears. Navarro comments: "The cochineal in tablets (known as cane of cochineal) milled and mixed with vinegar is astringent; in plaster it heals wounds, comforts the heart, head, and stomach. The same work depicts the *Macapatli* or *sarsaparilla (Smilax moranensis* L.) (Figure 2), a diuretic; the *Apoyomatli* or *Phatzi siranda (Cyperus articulatus* L.), a herb used by the Purepechas to alleviate chest pain and to strengthen the heart. The papaya *(Carica papaya* L.) and the common grape vine *(Vitis vinifera* L.) are cited as cordials.

On the end of the colonial era (first third of the XIX century) came to light the fundamental essays of Alexander von Humboldt and Aimé Bonpland on the geographical distribution of the American plants (phytogeography). A first edition appeared in 1807[16] and, then (1818), another edition in 4 volumes,[17] with the description of the Mexican flora in the fourth. In fact, in the notes by Antonio Pineda there is already an attempt to relate the vegetables with their geographical location. Besides, Tadeo Henke had already written about the geography of plants. Therefore, it can be stated that the botanists of the Malaspina expedition had some idea of phytogeography before this became settled definitively by von Humboldt in a 1794-letter to Schiller and, thereafter, in his publication of 1807.

BOOKS ON BOTANY IN NEW SPAIN

Aside from the already mentioned manuscript of 1552[1] and the reports transmitted by Friar Bernardino de Sahagún O.F.M. on the XI book of his *Historia general…* [General History…],[18] elaborated in New Spain, there are other works by European authors. The inventories of the university library, made in October of 1833,[19] cite texts of the XVI century such as the translation into Spanish of the classical treatise *De materia médica* [The Medical Subject] of Dioscórides Pedanio, by Dr. Andrés Laguna, in the original edition of Antwerp (1555). Likewise, XVII-century publications are mentioned; for example *Opera botanica medica* of the Italian Marcello Malpighi and the compilations already mentioned of the notes of Francisco Hernández.[8,9] Regarding the XVIII century, we find cited: *Histoire naturelle* complete by Georges-Louis Leclerc de Buffon, in its original edition (1749-1789) and the Spanish edition published in Madrid (1783-1791), the *Materia medica* by Jean-Pierre Bergeret, its last two volumes were completed by B.G.E. de Lacepède, posthumous publications in 1804, and the *Dictionnaire raisonné universel d'histoire naturelle* by Jacques Christophe de Valmont de Bomare (1800). Writings by the Swedish naturalist Carl Linnaeus, in Latin and Spanish; among them are: *Fundamenta botanica* (1735 and 1774) and *Philosophia botanica* (1751), where the author formalizes his binary classification system of plants, following and perfecting the original idea of the Swiss botanist Gaspard Bauhin. Aside of these works, there were: *Materia medica e regno vegetabili* (1778) of the Swedish author Jonas Bergius, *Bibliotheca botanica et index plantarum* (1720) by the Dutch professor Hermann Boerhaave, and *Opuscula botánica* by the Swiss physician and poet Albrecht von Haller, father of experimental physiology[20] and author of the ode *Die Alpen* [The Alps].

CLASSIFICATION ATTEMPTS OF THE AMERICAN VEGETABLES

The Spanish botanist Casimiro Gómez Ortega, then the director of the Botanical Garden of Madrid, had adopted the Linnaean criteria[21] for the classification of the vegetables according to their sexual organs. He used also the binary nomenclature –according to the Gaspard Bauhin criterion–,[22] which designated each variety with a noun referring to the genus and an adjective related to the species. The natural system of classification, already praised in the XVII century by Joseph Pitton de Tournefort[23] and by John Ray,[24] was in turn defined in the XVIII century thanks to the efforts of the French Antoine-Laurent de Jussieu and Michel Adanson, who emphasized the importance of the notion of natural family.

In June 1791, Don Vicente Cervantes invited all the naturalists of Mexico City to the inauguration of his course. He read an address in which he underlined the usefulness of botany and the absolute need to study it by physicians and pharmaceuticals, lecturing extensively on the importance of the medicinal plants of New Spain. Many were exhibited in the Botanical Garden, already located in the Viceroy Palace. There were also several scientific discussions and exchange of data and specimens among the members of the two expeditions, Sessé's and Malaspina's. However, there must have been some discrepancies,[25] given that Sessé's botanists were strictly orthodox in adopting the Linnaean system, whereas those of Malaspina were not. The first argued vehemently even with New Spain personalities enthused with botany, like the polygraph Alzate and the physicians Bartolache and Montaña. Likewise they had problems with Cavanilles,[26] of their same country, who catalogued the plants sent to Madrid with designations that did not correspond to the Linnaean systematization. On their side, Malaspina's botanists agreed with the criteria of the Swedish naturalist, but realized that many of the American plants did not fit into his rigid ordination molds. In fact, the notes of Luis Née refer to the virtues and properties of the vegetables, to the places where they were found, and to their correspondence or not with the Linnaean classification. At the beginning, description of the different species was made in Latin. Later on, it was decided to coin the names in Spanish, since, for that time, the works of Linnaeus had already been translated and published in Spain by Antonio Palau y Verdera.[27,28] Regarding the drawing of plants, it was decided to give them names in both Latin and Spanish.

The inauguration of the Royal Mexican Botanical Garden and of the Chair of Botany, in May 1788, occurred amid a climate of disagreement and mistrust among the Creole intellectuals originated by a series of regulations imposed by the Royal Botanical Garden in Madrid. Within the frame of this environment of protests, the illustrated Creole José Antonio Alzate, corresponding member of the Royal Academy of Sciences of Paris, since 1771, gave rise to a press polemic with Professor Cervantes regarding the Linnaean nomenclature. However, the situation changed radically in 1793, when Alzate published in his *Gaceta de Literatura* [Literature Gazette] of August 27, the *Oración* said on the opening of the Botany course on the 1st of June of the same year by the Baccalaureate Don Manuel María Bernal, professor of surgery and a disciple of that school […], composed by Don Vicente Cervantes, professor of the Royal Botanical Garden of México. The researcher Patricia Aceves expressed her opinion that the *Oración* constitutes the first research work published in México, in which the theoretical-practical principles of Lavoisier chemistry were applied.[12] Indeed, Cervantes states that the best method to detect the properties and virtues of the vegetables is the chemical analysis and, for that reason, he would proceed with it. Along the text, the author would appeal the authority of the works performed by European scientists. In regard to medicinal botany, he cited Linneus, van Helmont, Bauhin, Quer y Martínez, Koenig, Wadel, Collins, Parmentier, Acosta and Sieffent. Regarding chemistry, he mentioned Lavoisier, Chaptal, Macquer, Boerhaave, Ingenhouz, Sennebier, La Methérie, Hales, Duhamel, Sage, Baumé, Proust, Priestley, Creell, Bonnet, Tillet, Bucquet, and Hermatad.

It must be mentioned that the botany courses, in their first stage, were not well attended, perhaps because of a certain opposition by the University Council and the College of King's physicians *(Protomedicato)*. In general, physicians demonstrated great interest in botanical studies, but not the pharmacists who did not want to recognize the Mexican Botanical Garden as a center for their scientific and professional activity.

MEDICINAL BOTANY IN MEXICAN CARDIOLOGY

After a long interruption caused by the Independence War, foreign interventions, civil struggles, the teaching and research tasks started to develop systematically towards the end of the XIX century. The first research projects regarding medicinal botany were conducted at the National Medical Institute, founded in 1888, under the guidance of Dr. Fernando Altamirano (1848-1907), pioneer in pharmacological studies in México.[29]

Cardiovascular pharmacology assays were performed later on, on the initiative of Dr. Ignacio Chávez, in the small laboratories installed in 1927 as annexes to the Cardiology Unit of the Hospital General de la Ciudad de México.[30] At a later time, the valuable contributions of Dr. Rafael Mendez[31] started to impinge on the cardiological world. He created the Department of Pharmacology of the Instituto Nacional de Cardiología de México [National Institute of Cardiology of México]. Nowadays, the brilliant Mexican botanical-pharmacological trajectory is kept alive and striving in national scientific institutions.

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