



The causal dependence of present plant knowledge on herbals—Contemporary medicinal plant use in Campania (Italy) compared to Matthioli (1568)

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ABSTRACT

Aim of the study: Plant use has been the subject of many codices, documents and books and still is the subject of many scientific articles, trivial books and brochures. These texts, both historical and recent, exert a strong influence on local plant use, a means of knowledge transmission in particular European studies neglect to consider. Therefore, we determine the causal influence of historical texts on present medicinal plant knowledge using the example of Matthioli (1568) and contemporary ethnobotanical literature from Campania.

Materials and methods: We used Bayesian statistical inference and in particular the Bayesian Additive Regression Trees (BART) model to determine the causal effect of Matthioli on contemporary medicinal plant use in Campania.

Results: The estimation of the average increment of finding a plant species mentioned for a certain use category caused by Matthioli is about 20%, conditionally on the available data. Matthioli's effect is not negligible and lies between 14 and 25% with a high probability.

Conclusions: Studies on contemporary medicinal plant use in Europe over the last two to three decades still include the knowledge of the texts from the Renaissance and the classical writers. To what extent the remaining 80% contain autochthonous knowledge is difficult to assess. Considering the long-lasting effect of Matthioli, more recent books, brochures and newspapers very likely also exerted an influence. As well, television and radio reports on the results of pharmacological and clinical studies and, more recently, the world wide web show an ever-increasing influence.

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1. Introduction

1.1. Historical background—ancient texts on materia medica

From the very beginning, plants have been studied using both, utilitarian and philosophical approaches. From the classical times onwards it is possible to track the evolution of these two points of view, which during their fertile moments converged, resulting in codices, herbals and advances in systematic botany (Arber, 1938). Philosophy and the observation of nature during the ancient Greek culture are regarded as the basis of botany and medicine in the western world (Arber, p. 1; Mann, 1984, p.: 129). However, Greek medicine was heavily influenced by medicinal knowledge from Africa and Mesopotamia. Indeed, some of the earliest medicinal texts and writings devoted to knowledge about plants are

of Sumerian and Egyptian origin (Mann, p.: 129; Johns, 1990, p.: 264).

Sumerian clay tablets in cuneiform, probably written by Babylonian physicians or pharmacists (*asû*), contain descriptions of symptoms and recipes and are dated to the early second millennium BC (Geller and Cohen, 1995). Diseases were perceived as punishment by demons and therefore exorcism, divination and magic were the central weapon of Babylonian medicine (Schelenz, 1904, p.: 23; Mann, 1984, pp.: 20–53). In fact, another collection of tablets known as the “diagnostic handbook”, which lists symptoms of diseases from head to toe, is thought to have been used mainly by the incantation-priests (*āšīpu*; Geller and Cohen, 1995).

Campbell Thompson (1949) published a dictionary about Assyrian botany wherein he attempts to identify the plant species discussed on a series of clay tablets from the Royal Library at Nineveh dealing with the virtues and uses of drugs. The colophon to the work was appended by order of Ashurbanipal himself (King of all, King of Assyria, ca. 685–627 BC) but unfortunately has survived only in fragments. The most interesting fact obtained from this

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colophon, according to Campbell Thompson, is that the monarch states that the dictionary of plants is compiled from at least four pre-existing works, titles of which are quoted. Moreover, Ashurbanipal complains about the lack of logical order and the improper explanations of the difficult [plant] names in these earlier works.

The oldest Egyptian document containing a collection of recipes is the Ebers Papyrus, dated to the 16th century BC, and probably also presenting a transcription of several earlier texts (Mann, 1984, p.: 5). The German Egyptologist Georg Moritz Ebers (1837–1898) purchased the papyrus in Theben around 1872 (Schelenz, 1904, p.: 34). According to Schelenz, the influence of the cultures of the Near East on the Ebers Papyrus is evident. More evidently, however, the Egyptian *Materia Medica* influenced the Greek (see below). According to Mann (1984, p.: 53) the only real achievement of pre-Greek societies were the hygienic thoughts of the Jews, while the medicines of early Egypt, Mesopotamia or Palestine were shaped by gross superstition. The sanitary regulations of cleanliness such as the sterilization of utensils and the inspection of meat, as well as the measure of quarantine for infectious diseases were indeed unique to the People of the Book (Preuss, 1911, p.: xvi).

The emergence of scientific medicine in the West and its differentiation from supernaturalism and magical beliefs becomes apparent for the first time during the Age of Pericles (5th century BC; Mann, 1984, p.: 129) and in the work of Hippocrates (Johns, 1990, p.: 265). The collection of the Hippocratic writings (*Corpus Hippocraticum*) consists of about 70 distinct works and owes its origin to a number of physicians of the 5th century BC onwards, the most eminent of them being Hippocrates from Cos, who lived somewhere between 460 and 370 BC (Madaus, 1938; Marzell, 1938; Cosmacini, 1997). Altogether these writings, which are acknowledged above all for having advanced the studies of clinical medicine, mention more than 200 medicinal plants, which, however, are not described very well botanically (Tschirch, 1910, p.: 539; Marzell, 1938, p.: 13). The first work that can be considered a herbal is *De Historia Plantarum* by Theophrastus of Eresos (372–297 BC; Tschirch, 1910, p.: 542; Mann, 1984, pp.: 92–97). Theophrastus described 455 plants summarizing their medicinal properties, but is especially renowned for laying the basis of scientific and medical botany (Mann, p.: 96; Schelenz, 1904, p.: 118).

The work that has determined the form of every modern pharmacopoeia as well as popular and scientific plant nomenclature is *De Materia Medica* by Pedanius Dioscorides (ca. 40–90 AD), a physician of the Roman Army. One of the earliest and most beautifully illustrated manuscript copies of Dioscorides' *De Materia Medica* is the Byzantine Juliana Anicia Codex (ca. 512 AD) now residing in the National Library of Vienna and originally prepared as a gift for the daughter of the West Roman Emperor Clavius Anicius Olybrius (Arber, 1938, pp.: 8–9; Riddle, 1985 p.: 181). Herbalists and physicians of all nations have drawn their inspiration and instructions from Dioscorides (Madaus, 1938; Mann, 1984, p.: 112; Riddle, 1985). In the preface to *De Materia Medica* Dioscorides criticizes the superficiality, the incompleteness and the wrong order of contemporary works (c.f. Berendes, 1902, pp.: 19–20). It is also in his work, that the Egyptian influence on Greek medicine becomes obvious. *De Materia Medica* enumerates 80 plant-derived drugs as Egyptian in origin. Similarly, the use of fennel to soften clotted eyelids described in the Ebers Papyrus (Schelenz, 1904, pp.: 35–36) coincides with its use in *De Materia Medica* as an eye remedy (c.f. Berendes, 1902, Book 3, p.: 308, Chap. 74; Matthioli, 1568, Book 3, p.: 821, Chap. 76), while the use of *Artemisia* sp. against feverish diseases in the demotic papyrus from Fajjum (Westendorf, 1999, p.: 327) recalls its use against shivering (c.f. Berendes, 1902, Book 3, p.: 280, Chap. 26; Matthioli, 1568, Book 3, p.: 729, Chap. 26). Another Greek herbal comparable to that of Dioscorides and also extensively copied is *De simplicium medicamentorum facultatibus, libri XI* by Claudius Galenus (ca. 131–201 AD; Mann, 1984, pp.: 123–129).

Thanks to the introduction of book printing in the 15th century, books became widely available, and apart from religious texts herbals soon became the bestselling books of their time (Madaus, 1938, p.: 52; Mann, 1984, p.: 182; Adams et al., 2009). Printed herbals appeared in the late 15th century triggering a new botanical science in Germany that spread via the art of printing to Italy and elsewhere (Mann, 1984, p.: 183; Johns, 1990, p.: 266). The manuscript of the *Antidotarium Nicolai*, written during the 12th century at the School of Salerno, was first printed in Venice by Nikolaus Jenson (1420–1480) in 1471. This manuscript is considered the first general dispensatory used as a guide for composed medicines (Goltz, 1976, p.: 11). The *Ricettario Fiorentino* of the city of Florence, printed in 1498, is generally regarded as the first official pharmacopoeia (Corradi, 1887). Opinions about which was the first herbal ever printed differs among authors. According to Arber (1938) it was printed around 1470 and is the *Liber de proprietatibus rerum* by Bartholomeus Anglicus, a monk who lived during the 13th century, while the first book to contain a woodcut illustration was *Das buch der natur* (The Book of Nature) printed in Augsburg in 1475 (Arber, pp.: 13–14). According to Madaus (1938, p.: 52) the first printed herbal is the Herbarium of Apuleius Barbarus printed in Rome in 1483. Mann (1984, pp.: 92–93) reports that Theophrastus' *De Historia Plantarum* was printed at Treviso in the same year. In the appendix, Arber provides an overview on the principal herbals published between 1470 and 1670, but without considering all re-editions and translations (c.f. Arber, 1938, pp.: 271–285). *De Materia Medica* was first printed in Latin in 1478 by Aldus Manutius (1449–1515, Venice) and in Greek in 1499 by the same typographer (Arber, p.: 272). The Italian botanists did pioneering work in the identification of the plants described by the classical authors, firstly because the revival of classical culture started in Italy, and secondly because the Italian flora is related to that of Greece and to the other Mediterranean regions (Arber, p.: 92). Pietro Andrea Matthioli [Matthiolus], who was born in Siena in 1501 and died in Trieste in 1577, was the most renowned pharmacognosist and herbalist of the later Renaissance and one of the main commentators of Dioscorides' work (Schelenz, 1904, p.: 395; Arber, 1938, p.: 92). His chief work, *I Discorsi* (The Discourses), was translated into many languages and was printed in various editions and underwent several improvements. According to Osbaldeston (2000), Matthioli drew on the Byzantine Juliana Anicia Codex for his commentaries on *De Materia Medica*. Matthioli's *I Discorsi* was the most successful of all herbals and the earlier editions (until 1563) alone sold around 32,000 copies (Arber, 1938, p.: 94; Madaus, 1938, p.: 53; Marzell, 1938, p.: 25). The most recent re-edition of Dioscorides' *De Materia Medica* is that of Osbaldeston (2000). The opera by Pio Font Quer (1999) *El Dioscorides Renovado* (The Renovated Dioscorides) contains the plant species and taxa treated by Dioscorides and by the Castilian commentator Andrés Laguna (ca. 1511–1559), which on his turn was heavily influenced by Matthioli (c.f. Laguna, 1555). It is a popular scientific book edited for the first time in 1961 describing 678 medicinal species and with respect to *De Materia Medica* includes new entries such as *Digitalis* spp. So far *El Dioscorides Renovado* has sold over 25,000 copies. Also Nicholas Culpeper (1616–1654) adheres to Dioscorides in the work named after himself ("Culpeper's Complete Herbal"), while great parts of the text are translations of Dioscorides' *De Materia Medica*. The most recent edition of Culpeper's Herbal dates from 2007.

1.2. Research question

The above introduction shows the interrelatedness and mutual influence of historical written texts on medicinal plant use and that the very earliest writings testify to the importance of plants used in medicinal practices. The direct influence of written knowledge on local, so-called traditional and contemporary plant use, espe-

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