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The Croatian translation of *Flos medicinae*: from health instructions with medicinal plants to contemporary phytotherapy

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Received April 28, 2023, accepted June 8, 2023

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Pharmazie 78: 162-169 (2023)

doi: 10.1691/ph.2023.3017

Medieval European medicine relied on monasteries where ancient medical works were transcribed. Trade routes to the East and the influence of Arab medicine, which supplemented the knowledge of Greco-Roman physicians, enabled the foundation and development of the Salerno Medical School, whose most famous work is *Flos medicinae: Regimen sanitatis Salernitanum*. This medical textbook, written in verse and drawn up on the basis of ancient sources and empirical experiences of Salerno physicians, contains rules on how to preserve health, on diseases and the use of medicinal plants for medicinal purposes. The work was originally written in Latin, and was translated into Croatian by Franciscan Father Emerik Pavić (1768). It was the first medical book in the Croatian language. This paper provides an insight into the importance of *Regimen sanitatis Salernitanum* in medieval medicine and its influence on European medical literature through many translations, commentaries and analyses. In this context, ten recipes from the Croatian translation of *Flos medicinae* were researched and analysed which contain medicinal plants most of which grow in Croatia, and which were in use at that time: fig, fennel, anise, mallow, peppermint, sage, rue, nettle, celandine and willow. Most of the listed herbal drugs are used in contemporary phytotherapy and some of them have the potential for further research. The paper also deals with the particularities of the Croatian translation of this medical textbook, which can be used for further multidisciplinary research involving medicinal and pharmaceutical historians, botanists and philologists.

1. Introduction

For centuries, medical treatment was based on the use of drugs of plant, animal and mineral origin, until the development of synthetic drugs in the late 19th and early 20th centuries. In the pre-civilisation era, medicine was going through different phases: empirical, demonistic, animistic and magical-religious (Schmitz 1998). In Ancient Greece and Rome, the systematic study of plants and their use can be found in the works of Dioscorides, Theophrastus and Pliny the Elder, which represent the basis of the botany and pharmacognosy we know today (Sonnedecker 1976). These works had a major impact on medieval and modern medicine and pharmacy in Europe. During the Middle Ages, the backbone of medical treatment was religion in connection with medical experience. Monasteries were the sites for the care of the sick, where monks had the role of preserving and transcribing ancient medical texts (Siraisi 1990). In that period, a special place belongs to the Salerno Medical School, a medieval secular medical centre, and its most famous work *Regimen sanitatis Salernitanum*, also known as *Flos medicinae*, which was translated from Latin into Croatian by Franciscan Father Emerik Pavić in 1768 (Mediolano's *Flos medicinae*, tr. Pavić 1768). It was the first printed medical textbook in the Croatian language (Fatović-Ferenčić and Dürriegl 2014).

The aim of this paper is to provide an insight into the significance of this work in European medieval medical literature and to describe the influence it had over the centuries through translations, commentaries and analyses of this work in many European countries. In this context, the contribution of the Croatian translation of *Flos medicinae* is also examined. Recipes with ten medicinal plants (sage, mallow, rue, mint, anise, fennel, etc.) mentioned in the Croatian translation of *Flos medicinae*, which were most often used in medical treatment in the area of Croatia, are selected, and the importance and use of these drugs in today's phytotherapy is highlighted. The specific characteristics of the Croatian translation

of this medical textbook and selected recipes with herbal drugs are also examined. Translating ancient plant names into modern languages is a potential source of errors because plant names may have changed over time. Thus, the correct identification of plants according to modern taxonomy is difficult in many cases, because the same names could have been used in ancient times for different species (Yarnell and Touwaide 2019). Therefore, the paper does not always specify the exact plant species. In interpreting the folk names of plants and their synonyms, listed in a number of recipes of the Croatian translation, available dictionaries were used (Šulek 1879; Kušan 1956; Šugar 2008; <https://www.scribd.com/>), and today's Croatian names and Latin names of plants that could correspond to today's taxonomy were added. The English translation of the Latin source text, made by John Ordranax (*Regimen sanitatis Salernitanum*, tr. Ordranax 1871), was used for the comparison and analysis of the text. This translation is based on Zacharias Sylvius's edition, published in Rotterdam (1657), which includes the commentary by Arnaldus de Villa Nova (1235 – 1311), a prominent 13th-century physician. The Latin edition by Zacharias Sylvius, printed in the Hague (1649), served as the source text for the Croatian translation of these health instructions (Tartalja 1958; Sinno 1941) and is almost identical to the 1657 edition. The full title of the source text for the Croatian translation is *Flos medicinae, sive scholae Salernitanae de conservanda bona valetudine praecepta metrica*, by Joanne de Mediolano (Mediolano's *Flos medicinae*, tr. Pavić 1768) (Fig. 1).

2. Salerno Medical School

The Salerno Medical School, the first European medical school and a forerunner of medical universities, was founded in the southern Italian city of Salerno thanks to an exceptional coincidence of historical, cultural and geographical factors (Monica et al. 2013). As

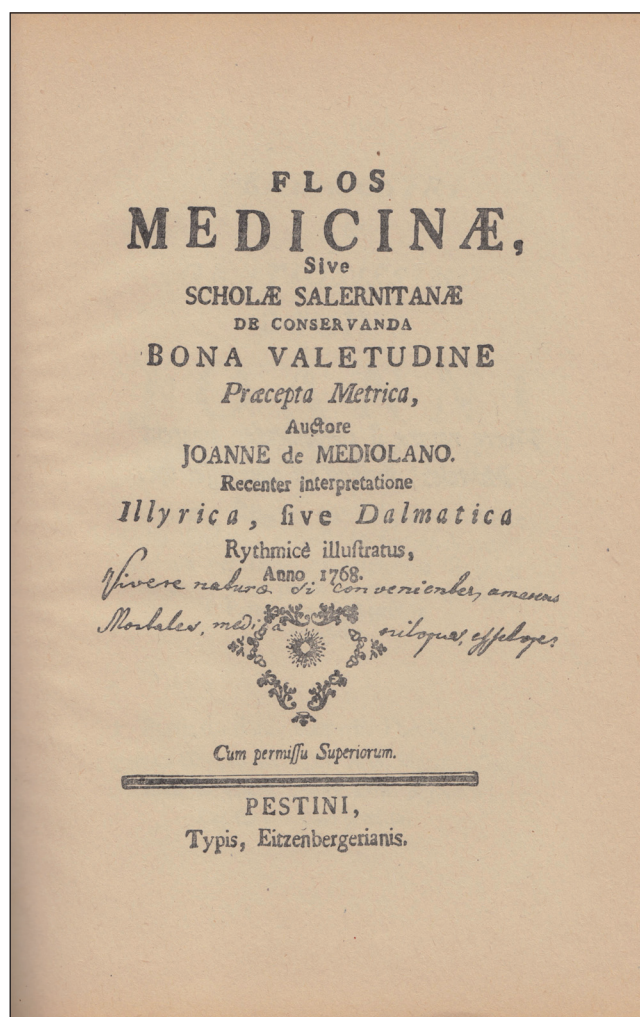


Fig. 1: The cover of the Latin source text *Flos medicinae*, based on which Emerik Pavić made his Croatian translation of the Salerno Rule of Health.

a trade centre in a favourable geographical position on the Mediterranean Sea, Salerno was a meeting place of the Christian, Arab and Byzantine worlds, as well as of various medical cultures (Greek, Arab, Latin and Jewish) (Longobardi et al. 2021). We do not know much about the beginnings of the Salerno Medical School, but since the second half of the 10th century, the city had been mentioned in chronicles as a celebrated medical centre (Kristeller 1945). In the beginning, the school was most likely associated with Benedictine monasteries whose monks and nuns, among other duties, cultivated medicinal plants in the monastery gardens, treated the sick, taught others about the cultivation and use of medicinal plants, and transcribed classical Greek and Roman works by hand (Ha 2022). A Benedictine monastery in Salerno, which had existed since the beginning of the 8th century, was in lively cultural exchange with other Benedictine monasteries, especially with the one at Monte Cassino, where there was a special interest in medicine (Monica et al. 2013). The decisive event in the development of the school was the arrival in Salerno of the Arab physician Constantine the African (1010 – 1087) in 1077. He brought with him 37 medical works by Arab authors, as well as Arabic translations of several works by Hippocrates and Galen, which he translated from Arabic into Latin for the monastery library at Monte Cassino (Ha 2022). These translations played a significant role in expanding the availability of the medical knowledge of the time, because at that time the Arabs had at their disposal more classical Greek medical works than the West, and with their commentaries and independent works, they made an important contribution to the ancient heritage (Kristeller 1945). Thus, Arabic and ancient medical works, along with the medical knowledge and practice of Salerno physicians,

formed the scientific base of the Salerno Medical School (Monica et al. 2013). Thanks to the secular character of the Salerno Medical School, it included women physicians and professors (Corner 1931). After the 13th century, the Salerno Medical School slowly began to lose its importance, as new medical schools were opened all over Europe, such as the famous medical schools in Bologna, Montpellier, Paris and Padua. The Salerno Medical School was abolished by Napoleon in 1811 (Glesinger 1954).

2.1. *Regimen sanitatis Salernitanum*

The medical knowledge of the Salerno Medical School has been preserved in many texts, among them the popular work *Regimen sanitatis Salernitanum* (*The Salerno Rule of Health*) or *Flos medicinae Salerni* (*The Flower of Medicine of Salerno*). In the period between the 11th and 13th centuries, these texts were jointly compiled by some prominent Salerno physicians, and they were printed in numerous editions and translated into several European languages, which confirms their centuries-old exceptional influence on medical literature (Harrington 1990). The great success of *Regimen sanitatis Salernitanum* is attributed to the fact that it was not a classic medical textbook, but a practical guide rich with advice and recipes useful not only to physicians but also to ordinary people. It was written in Latin rhyming hexameter verse, so its recommendations were easy to remember (Bifulco et al. 2020). *Regimen Sanitatis* originally consisted of 364 Latin verses. During the following centuries, the number of verses in numerous manuscript and printed editions increased, and numerous translations and commentaries of this work were published in many European languages (Ledermann 2013). The most famous and the most popular commentary is by Arnaldus de Villa Nova, in which, in accordance with the spirit of scholasticism, individual health rules are supplemented with quotes from Hippocrates and Galen, and famous Arab physicians such as Avicenna and Rhazes. Dietary and hygienic rules of *Regimen* were not only spread as independent manuscript books, but also became part of other medical works of the Middle Ages. In the 16th century, illustrated editions of the *Regimen* in Latin were highly sought after. In its original form, this is a work that summarises the medical knowledge of the time in a short, but clear and understandable way (Schultheisz 1960). Many authors have researched and analysed this work due to its importance in the prevention of diseases and treatment of people throughout the centuries (Weiss Adamson 1995). *Regimen* includes much dietary and hygienic advice, aimed at achieving health and well-being through moderation and tolerance. It can be divided into several parts according to its content: the first part is dedicated to hygiene and nutrition, the second part deals with the use of medicinal plants, the third concerns the anatomy of the human body, the fourth part discusses physiology, and the last part is dedicated to therapy. Anatomical, physiological and pathological knowledge served as the basis for an exhaustive discussion of hygienic and dietary explanations, which were necessary in the Middle Ages because doctors were hard to come by. Many of these health rules still apply today (Divitiis 2004; Zahajska et al. 2022). Other medieval authors, such as the German physician Konrad von Eichstätt (ca. 1280 – 1342), the author of one of the most important texts of medieval dietary literature, wrote about health and well-being. His health rules in Latin served as a source for other late medieval works on healthy lifestyle rules (Hagenmeyer 1995).

3. Franciscan Father Emerik Pavić and the Croatian translation of *Flos medicinae*

The Salerno Rule of Health was translated from Latin into Croatian by Franciscan Father Emerik Pavić (1716 – 1780) under the title *Flos medicinae* (in Croatian *Cvit likarije*), and the textbook was printed in Pest in 1768. The Croatian translation contains 644 verses, compared to the Latin source text which has 395 verses, incorporated in 101 chapters. Each chapter begins with a Latin title followed by the Latin source text, a title in Croatian and the Croatian translation of the text in verse. We find the influence of the Salerno Medical School in Croatian ecclesiastical literature

even before Pavić's translation. Certain verses and fragments of the Salerno Rule of Health were recorded in the Zagreb breviary from the 15th century, the missal of the Zagreb Diocese from 1611, and in the liturgical book of the Pauline Fathers from 1664, which has various health instructions appended to it, similar to those of the Salerno Medical School. Therefore, *Flos medicinae* (*Cvit likarije*) became the first complete medical book translated into Croatian (Tartalja 1958).

Emerik Pavić completed theology and philosophy studies in Buda (today's Budapest). For years he was a preacher in Slavonia and Vojvodina (parts of the Habsburg Monarchy at the time) and wrote works of a religious character in Latin, but also many translations and interpretations in Croatian, which were intended to educate people. In his everyday interaction with people, Pavić recognised the human need for health maintenance and treatment, especially in rural areas where physicians were hard to come by. The translation of the Salerno Rule of Health was intended for the population at large, which is confirmed by the fact that the poem was translated in rhyming decasyllabic verse, the most famous verse of the South Slavic area, with understandable folk expressions. This made health instructions and recipes available to the wider population because they could be memorised more easily, which was practical at the time when literacy was low. It is known that health reforms were introduced in Croatia not until 1770 when, during the reign of Empress Maria Theresa (1717–1780), the law on medical care was passed. In this context Pavić's translation had an exceptional health and educational role and importance in the prevention and (self) treatment of ailments, especially in rural areas of Croatia where healthcare was poorly developed (Tvrković 2014).

In translating condensed Latin verses into Croatian, Pavić had to pay attention to rhyme and syllables in order to satisfy the poetic form, which is why the translated verses were interpreted differently from the Latin source text, for example in case of the recipe with figs (*De Ficubus*) (Mediolano's *Flos medicinae*, tr. Pavić 1768, XLI. p. 26). Since Pavić was not a naturalist, several mistranslations of plant species can be observed in his translation of the Latin verses, such as poppy (*Papaver* L. spp.), which was translated as pepper (*Piper* L. spp.) in the recipe with figs, or tansy (*Tanacetum* L. spp.), which was translated as wormwood (*Artemisia* L. spp.) in the recipe about sage (Mediolano's *Flos medicinae*, tr. Pavić 1768, LVIII. p. 33). Pavić translated orpiment (*auripigmentum*) as the chemical element arsenic (*arsenik* in Croatian translation), although the Latin name refers to arsenic trisulfide (As_2S_3) (Mediolano's *Flos medicinae*, tr. Pavić 1768, LXXXI. p. 44). Some verses from the Latin source text are missing, especially those that give advice about love life, such as in the willow recipe (*De Salice*) (Mediolano's *Flos medicinae*, tr. Pavić 1768, LXX. p. 40) (Fig. 2). Pavić left a blank space with two dots for the Latin word *coitus* (intercourse) in the advice for the preservation of sight (*De Nocumentis Visus*) (Mediolano's *Flos medicinae*, tr. Pavić 1768, LXXVI. p. 42), and in the same way he omitted the verses that mention love in the chapter on the four seasons (*De quatuor Anni temporibus*) (Mediolano's *Flos medicinae*, tr. Pavić 1768, LXXXIII. p. 47). Verses about women's fertility in the recipe with leeks (*De Poora*) were also omitted (Mediolano's *Flos medicinae*, tr. Pavić 1768, LXXII. p. 40–41), as well as verses about mallow, which is recommended for menstrual problems (Mediolano's *Flos medicinae*, tr. Pavić 1768, LVI. p. 32). It can be assumed that Pavić, as a priest, intentionally left out the mentioned verses and words as such topics and problems were probably not publicly discussed or mentioned in writing at that time.

Linguistically, the verses were composed according to the orthographic norms of the time, so instead of distinctive Croatian sounds č, ć, đ, š, ž, substitute letters were used: *cs* (č), *ch* (ć), *gj* (đ) *ss* (š), *x* (ž), while the sound dž was written as *cx*. Some sounds in certain words were unnecessarily doubled: *ottok*, *mallo*, *ottiruje*, *mirra*, etc. Recipes with medicinal plants are simple, almost without measures and quantities (a cup is mentioned as a measure for dosing on two occasions) (Mediolano's *Flos medicinae*, tr. Pavić 1768, LXIV. p. 37), and auxiliary ingredients for making the preparations mentioned in the text are most often used

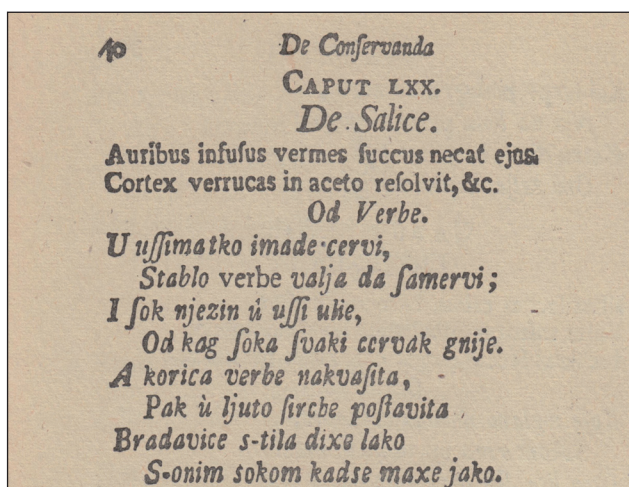


Fig. 2: The Latin source text about the healing properties of willow (*De Salice*) and the Croatian translation, in which the verses about love advice were omitted (Mediolano's *Flos medicinae*, tr. Pavić 1768, LXX. p. 40).

daily in households (water, vinegar, wine, honey, etc.). The verses mostly mention the medicinal plant itself, and less often the herbal drug (mallow root, fennel and mustard seeds, willow bark) or the medicinal form in which the preparation is made (juice). Such a simple approach to medical treatment is characteristic of this type of literature, which was intended primarily for poorly educated rural population. We find such approach in a number of Croatian *ljekaruše*, handwritten collections of folk recipes, which were largely based on ancient medical literature and the Salerno Rule of Health (Inić and Gašparac 2022).

This poem also mentions the health recommendations of famous ancient physicians and naturalists such as Hippocrates, Galen, Asclepius and Pliny the Elder, suggesting that different sources were used to write these health instructions. It is interesting that the chapter entitled *De Letalium venenorum remediis*. (*Of Antidotes to Poisons*, in Croatian *Od likariah protiva jidu*) (Mediolano's *Flos medicinae*, tr. Pavić 1768, XII. p. 13) also mentions theriac (*Theriaca*), a remedy that was considered a universal cure for all diseases (panacea) and antidote from the time of its original preparation by Mithridates in the 2nd century BC and its formulation in the 1st century BC to the mid-18th century (Griffin 2004). Some recipes and recommendations from this textbook more reflect the world-view of medieval Christianity than medical treatment, so they have no medical significance today. Therefore, these health instructions are also a historical document that gives an insight into the diversity of approaches to health and disease over the centuries (Fatović-Ferenčić and Dürriegl 2014). Due to the linguistic, medical and pharmaceutical peculiarities of the text, this textbook is interesting not only to medicinal and pharmaceutical historians, but also to philologists (Lukšić et al. 2015; Pilj Tomić 2016).

3.1. Recipes with medicinal plants in “*Flos medicinae*” (“*Cvit likarije*”)

Many chapters of *Flos medicinae* list medicinal plants for the treatment of various conditions and ailments that were common at the time. For example, fig (*Ficus carica* L.) is described in Pavić's translation of the recipe *De Ficubus*. (*Of Figs*, in Croatian *Od smokava*.) as a remedy against tumours, swollen glands and as a remedy for healing bones: *Fig reduces swellings and swollen glands, / It heals broken bones in both arms and hands...* Although in the Latin source text fig is recommended for the treatment of broken bones in combination with poppy (*Papaver* L. spp.), Pavić omitted poppy, probably because of the rhyme. In the verses that follow, he incorrectly translated poppy as pepper (Croatian *biber*) and stated that when mixed with figs, it arouses passion: *When you eat them together with sugar, / And then you also sprinkle some pepper. / Its then that they make lice breed and adjust, / And*

equally arouse passion and lust (Mediolano's *Flos medicinae*, tr. Pavić 1768, XLI. p. 26) (Fig. 3).

In the English translation of the almost identical Latin source text with Villa Nova's comments, we see that its poppy-heads that, in combination with figs, heal bones. The translation also includes the method of using fig in the form of poultice: *Fig-poultice will our bodies rid of tumors, / Scrofula, boils and even peccant humors; / 'Twill surely draw – add poppy-heads alone – / The splintered fragments from a broken bone* (Regimen sanitatis Salernitanum, tr. Ordonaux 1871, 43. p. 83).

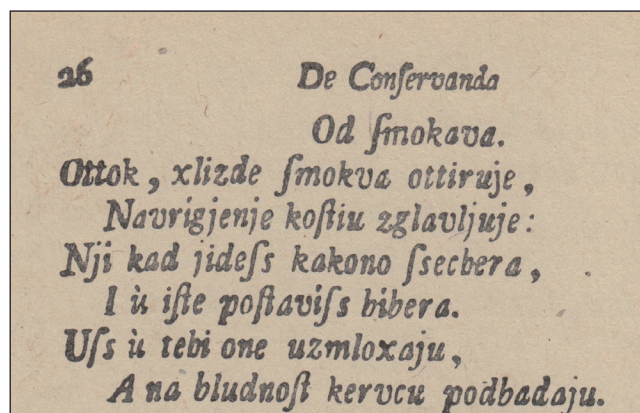


Fig. 3: Croatian translation on the use of figs as a remedy (*Od smokava*). Poppy is mistranslated as pepper (Croatian *bibera*) in the verses (Mediolano's *Flos medicinae*, tr. Pavić 1768, XLI. p. 26).

Today we know that fig fruit (*Caricae fructus*) acts as a mild laxative and is used in the form of cold macerate, syrup and as a fruit cube for mild constipation. Poppy (*Papaver somniferum* L.), which Pavić mistaken for pepper in the poem, is used to obtain opium, a natural drug with alkaloids that is now used for the industrial isolation of certain alkaloids (morphine, codeine, thebaine, papaverine and noscapine). Morphine, as the main alkaloid of opium, is considered to be among the most effective analgesics, calming the cough centre and soothing intestinal motility. It was discovered by a German pharmacist Friedrich Sertürner (1783 – 1840), who named it after the Greek god of dreams *Morpheus* because it can, as a strong narcotic, induce sleeping (Mosher 2013). Codeine is an antitussive, papaverine is a strong antispasmodic, and noscapine has a central antitussive effect (Kuštrak 2005).

Fennel seed (*De Semine Foeniculi*) is described in *Cvit likarije* as a carminative, a remedy for fever, constipation and better eyesight: *Of Fennel Seed. / It helps flatus from body to expel, / It kills toxins and the person feels well. / Poison-free body fennel ensures, / For fever it's one of the best cures, / It makes the stomach feel empty and light, / It also helps increasing ease of sight* (Mediolano's *Flos medicinae*, tr. Pavić 1768, XLVII. p. 28–29).

Pavić uses different folk names for fennel (*Foeniculum* Mill. spp.) In this recipe, he mentioned it as *kopar*, while in the health instruction *De Corroborantibus visum*. (*Of Things Strengthening the Sight*, in Croatian *Od pokripljujućih vid.*), he translated it as *morac* (Mediolano's *Flos medicinae*, tr. Pavić 1768, LXXVII. p. 43) (Fig. 4). In Pavić's translation, *slatki kopar* (literally translated as sweet fennel) is a folk name for anise.

The Greek name for fennel (*Foeniculum vulgare* Mill.) is *marathon*, and it is interesting that the site of the famous battle of Marathon (490 BC), after which the discipline in athletics is named, literally means a fennel plain (Liddell and Scott 1940). Today, fennel fruit (*Fructus foeniculi*), according to Herbal Anatomical Therapeutic Chemical (Herbal ATC) classification, is classified as a herbal carminative and expectorant (Grdinić and Kremer 2009), and it has a monograph in the new, 11th edition of the European Pharmacopoeia (European pharmacopoeia 2022). It is valued in paediatric practice as an antispasmodic (for relieving infant colic) (Willfort 1978). Scientific research confirms its many



Fig. 4: Fennel in Pavić's translation of *Flos medicinae* has different folk names: *kopar* and *morac*. Taken from: Verzascha B, Matthioli PA, Camerarium I (1678) *Neu vollkommenes Kräuter Buch: von allerhand Gewächsen der Bäumen...*, Johann Jacob Decker, Basel..., p. 456. The book is kept in the library of the Department of Pharmacognosy, University of Zagreb Faculty of Pharmacy and Biochemistry.

biological activities: antibacterial, antiviral, antifungal, anti-tumour, etc. (Badgujar et al. 2014).

Anise (*De Aniso*.) is described as a remedy for the stomach: *... Sweet fennel makes stomach pain go away*. In order to keep the rhyme consistent, in the second verse Pavić describes anise (*Pimpinella* L. spp.) only as a plant that gives beauty to the eyes: *Making the eyes sparkle bright every day* (Mediolano's *Flos medicinae*, tr. Pavić 1768, XLVIII. p. 29). The Latin source text contains the phrase *emendat visum*, a more accurate translation of which would be *to improve eyesight*, as indicated in the English translation: *... And human sight improves as well as clears ...* (Fig. 5) (Regimen sanitatis Salernitanum, tr. Ordonaux 1871, 50., p. 87).

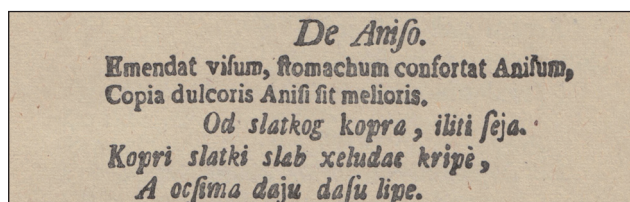


Fig. 5: Latin verses about the healing properties of anise (*De Aniso*.) and the Croatian translation in which, due to the rhyme, Pavić omitted the medical use of anise to sharpen vision (Mediolano's *Flos medicinae*, tr. Pavić 1768, XLVIII. p. 29)

Anise (*Pimpinella anisum* L.) is a medicinal essential oil-bearing plant, and its seeds (*Anisi fructus*) are used in modern phytotherapy as an expectorant and carminative (Wichtl 2001). The drug is included in the latest 11th edition of the European Pharmacopoeia (European pharmacopoeia 2022). Many conducted studies show that anise seeds have various pharmacological effects (antimicrobial, antifungal, antiviral, antioxidant, analgesic, anticonvulsant, etc.). To confirm these properties, it is necessary to carry out more clinical trials on humans and to test the active ingredients of this plant as potential medicines (Shojaii and Abdollahi Fard 2012). Mallow (*De Malva.*) is described in *Cvit likarije* as a laxative only: *Of Mallows. / Grounded mallow root will smoothly dissolve, / Constipation problems it will resolve.* In the translation, Pavić omitted the Latin verses: *Vulvam moverunt, et fluxum saepe dederunt* (Mediolano's *Flos medicinae*, tr. Pavić 1768, LVI. p. 32) which describe mallow as an emmenagogue (increasing menstrual flow), probably due to ignorance of such women's problems, which were apparently taboo subjects at that time, especially among priests (Fig. 6).

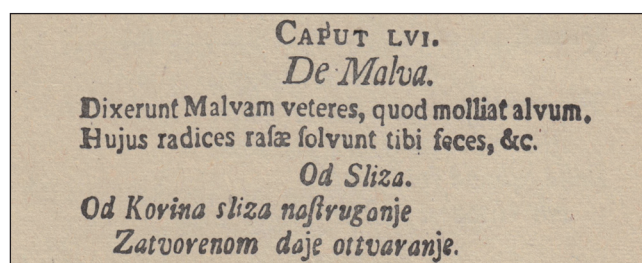


Fig. 6: Latin verses about mallow (*De Malva.*) and the Croatian translation (*Od Sliza.*). Pavić marked the omitted verses about mallow as an emmenagogue with etc. (Mediolano's *Flos medicinae*, tr. Pavić 1768, LVI. p. 32).

This verse is present in the English translation of the Latin source text as ... *Moreover, too, Emmenagogue they prove* (*Regimen sanitatis Salernitanum*, tr. Ordonaux 1871, 58. p. 94–95). The title in the Latin source text contains the name of the plant *Malva* (*Malva* L. spp.), which according to the present taxonomy would correspond to the mallow genus (*Malva*) in the family *Malvaceae*. The flower (*Malvae flos*) and leaf (*Malvae folium*) of common mallow (*Malva sylvestris* L.) are applied in conventional medicine as mucilaginous drugs that are used in the treatment of inflammation of the mucous membrane of the throat and digestive tract (Wichtl 2001; Grdinić and Kremer 2009). They are most often used in the form of teas and for external use as solutions for gargling, as well as for baths (Kuštrak 2005). However, the recipe mentions the use of mallow root, so it can be assumed that it is about marshmallow (*Althaea officinalis* L.), which belongs to the same family. Today, marshmallow root (*Althaeae radix*) has a different indication for use than the one listed in the Salerno textbook. According to the Herbal ATC classification, it is classified as a herbal mucilaginous remedy, herbal emollient and protective, as well as an antitussive (Grdinić and Kremer 2009). It is officially used as an antitussive for inflammation of the mucous membrane of the upper respiratory tract and as a mucilaginous agent for inflammation of the mucous membranes of the gastrointestinal system. It is most often used in the form of a cold macerate to relieve an irritating cough (Willfort 1978).

Mint (*De Mentha.*) is described in this textbook as an anthelmintic: *To remove parasites, have belief, / You must make sure to eat a fresh mint leaf* (Mediolano's *Flos medicinae*, tr. Pavić 1768, LVII. p. 32–33). In the title, Pavić uses the vernacular name *vrtna metvica* (*Od metvice vertne.*) for mint (*Mentha* L. spp.), which literally translates to *garden mint*, while in the English translation *Mentha* is translated as *mint* (*Regimen sanitatis Salernitanum*, tr. Ordonaux 1871, p. 95). The name of the genus *Mentha* comes from the Greek word *Mintha*, which is the name of a mythical nymph who transformed into this plant (Pushpangadan and Tewari 2006). Today, in accordance with the Herbal ATC classification,

peppermint (*Mentha piperita* L.) leaf is classified as a herbal carminative and is used to improve digestion (Grdinić and Kremer 2009). It is included in the new edition of the European Pharmacopoeia, and it is mostly used in the form of a tea beverage for acute and chronic gastritis and enteritis, spasms in the gastrointestinal system, as well as as an antispasmodic, stomachic, carminative and antiseptic. It increases the volume of secretion of bile from the liver (choleric), and it is also attributed a sedative effect, so it is a component of calming teas (Kuštrak 2005).

Sage (*De Salvia.*) is described in the recipe as a plant with many medicinal properties: *Why would a person from this world depart? / If a sage well grows at his garden's heart. / Sage soothes the soul and body as well. / It stills a trembling hand in parallel. / The strongest fevers keep away from it, / A person is quickly back on his feet...* (Mediolano's *Flos medicinae*, tr. Pavić 1768, LVIII. p. 33). The Latin verses also mention the plant species *Athanasia*, which appears in the English translation as tansy (*Tanacetum* L. spp.): ... *With tansy, and the cress, first gifts of spring, ...* (*Regimen sanitatis Salernitanum*, tr. Ordonaux 1871, 60. p. 95) while Pavić translates it as wormwood (*Artemisia* L. spp.): ... *Lavender, sage, as well as garden herbs, / Will be of great help if fever disturbs, / Watercress, vegetables and wormwood, / With the help of God will make you feel good.* It can be assumed that Pavić made a mistake in the translation due to the similarity in the Latin name of the plants *Athanasia* (tansy) and *Artemisia* (wormwood). The name tansy is derived from the Greek word *athanasia*, meaning immortality, most likely due to the fact that its yellow flowers do not wilt when dried (Aćimović and Puvača 2020). Sage (*Salvia* L. spp.) (Fig. 7) is a Mediterranean plant whose name is derived from the Latin word *salvare* (to heal or save), and the first two verses of the recipe confirm the many medicinal properties attributed to it (Fatović-Ferenčić and Dürriĝl 1997).



Fig. 7: In *Flos medicinae*, sage is described as a plant with many medicinal properties. Taken from: Matthioli PA (1568) *I discorsi di M. Pietro Andrea Matthioli sanese, medico cesareo, et del serenissimo principe Ferdinando archiduca d' Austria &c. nelli sei libri di Pedacio Discoride Anazarbeo della materia medicinale in Venetia*, p. 747. The book is kept in the library of the Department of Pharmacognosy, University of Zagreb Faculty of Pharmacy and Biochemistry.

In modern phytotherapy, sage (*Salvia officinalis* L.) leaf is used in the form of an infusion for rinsing and gargling for the treatment of inflammation of the mucous membrane of the mouth and pharynx, for dyspeptic ailments and as an antihydrotic (reduces sweating) (Schaffner et al. 1999). The European Pharmacopoeia included also this drug in its monographs (European pharmacopoeia 2022). Today, its numerous pharmacological effects (anti-inflammatory, antiseptic, gastroprotective, antidiabetic, anticancer, etc.) have been proven. It therefore has potential in the treatment of numerous diseases, including diabetes, depression, obesity, dementia, lupus, heart and malignant diseases. In recent studies, the antimicrobial properties of sage have also been reported, which are attributed to the synergistic effect of essential oils and tannins (Grdiša et al. 2015).

Rue (*De Ruta.*) is described as a remedy with a positive effect on eyesight: *Of Rue. / Cause of rue the world looks really bright, / If used often it will sharpen one's sight. / When eaten raw the one thing that is true, / Your eyes for sure will never lie to you...* It is also recommended as a flea remedy: *... Rue, when cooked and applied in case of fleas, / Be certain that you will get rid of these* (Mediolano's *Flos medicinae*, tr. Pavić 1768, LIX. p. 34).



Fig. 8: Rue is recommended in *Flos medicinae* as a remedy for impaired vision, and future studies are to confirm its potential in the treatment of many diseases. Taken from: Verzascha B, Matthiolo PA, Camerarium I (1678) *Neu vollkommenes Kräuter Buch: von allerhand Gewächsen der Bäumen...*, Johann Jacob Decker, Basel..., p. 426. The book is kept in the library of the Department of Pharmacognosy, University of Zagreb Faculty of Pharmacy and Biochemistry.

Rue (*Ruta graveolens* L.) is an essential oil-bearing drug. In traditional medicine, rue is used for pain relief, vision problems, rheumatism and dermatitis (Ratheesh and Helen 2007). Its positive therapeutic effects were recognised by some of the greatest Greek and Roman authors such as Hippocrates, Dioscorides, and Pliny (Miguel 2003). Extracts of this plant have been used since ancient times as an antidote for snake and scorpion bites (Sallal and Alkofahi 1996). Today, it has been proven that the biologically active components of *R. graveolens* have antibacterial, analgesic, anti-inflammatory, antidiabetic and insecticidal effects. Rutin, as the most important phytochemical compound, acts as an emmenagogue (Asgarpanah and Khoshkam 2012). Future studies are to confirm the safety, quality and effectiveness of the biologically active substances of rue as a potential drug for the treatment of various diseases, including the treatment of cancer cells in humans (Varamini et al. 2009; Ghramh et al. 2020) (Fig. 8).

Nettle (*De Urtica.*) is described as a remedy that enables better sleep for the sick: *For nettle, interesting here's a thing, / Peaceful slumber to the sick it will bring.* It is also described as an antiemetic, and when prepared with honey, it is a remedy for stomach cramps: *There really is no doubt in whether, / It makes nausea and vomiting better. / By eating honey containing its seed, / The stomach from painful colic is freed.* In the recipe, nettle (*Urtica* L. spp.) is also recommended for cough relief in the form of a drink, but its preparation is not specified. We can assume that it is an infusion because it is still used today in that form: *When used as a drink, nettle will drive off, / Any lasting and irritating cough.* Its healing effect on the liver and joints is also mentioned: *It also relieves stomach tension, / And help heals liver, one needs to mention. / There is one more thing nettle does with ease, / It will help to cure any joint disease* (Mediolano's *Flos medicinae*, tr. Pavić 1768, LXIII. p. 36).

Nettle (*Urtica dioica* L.) herb is used as a diuretic in modern phytotherapy, and has anti-inflammatory and anti-rheumatic effects (Wichtl 2001). According to the Herbal ATC classification, nettle root is classified as a herbal diuretic and herbal medicine that has a beneficial effect on prostate diseases (Grdinić and Kremer 2009). Nettle leaves contain many vitamins, minerals and antioxidant compounds (polyphenols, carotenoids, etc.), so besides pharmacological they also have nutritional value (Kumari Bhusal et al. 2022). Its monograph can be found in the 11th edition of the European Pharmacopoeia (European pharmacopoeia 2022).

The authors from Salerno probably used the medical work of the ancient philosopher and naturalist Pliny the Elder, mentioned in the text, to write the recipe with celandine (*De Chelidonia.*). In the Croatian translation, the health instruction refers to a swallow that restores eyesight to its blind young by applying celandine (*Chelidonium* L. spp.): *To use celandine all swallows adore / Perfect vision to their young to restore, / That all swallows know in this way to act, / In his work Pliny mentions the same fact* (Mediolano's *Flos medicinae*, tr. Pavić 1768, LXIX. p. 39). In the English translation, there is also a verse about the fact that celandine restores sight to those whose sight has deteriorated with age: *And Pliny writes that if this be employed / Vision returns to eyes of old, destroyed (Regimen sanitatis Salernitanum, tr. Ordranax 1871, p. 103).* This verse also highlights the medical use of celandine for the treatment of impaired vision in humans. The Latin name of the genus *Chelidonium* comes from the Greek word *khelidôn* (*chelidon* in Latin), which translates as swallow because the plant begins to bloom with the arrival of swallows, and fades with their departure to warmer regions, as stated by Dioscorides in his most famous work *De Materia Medica*. He also refers to a folk tale that says that swallows restore sight to their blind young with the help of celandine, which Pliny the Elder also took over in his work *Naturalis Historiae* (Zielińska et al. 2018). Pavić connected the use of the plant in the health advice with that folk tale but omitted its medical indication (Fig. 9).

According to the Herbal ATC classification, celandine herba (*Chelidonii herba*) belongs to the group of herbal cholagogues and choloretics, and the root (*Chelidonii radix*) belongs to the group of herbal analgesics and antipyretics with alkaloids (Grdinić and Kremer 2009). Drugs are applied in the form of tinctures or extracts



Fig. 9: In the Croatian translation of *Flos medicinae*, celandine has no medical indication, and today this plant arouses increasing interest in further scientific research. Taken from: Matthioli PA (1568) *I discorsi di M. Pietro Andrea Matthioli sanese, medico cesareo, et del serenissimo principe Ferdinando archiduca d'Austria &c. nelli sei libri di Pedacio Discoride Anazarbeo della materia medicinale in Venetia*, p. 664. The book is kept in the library of the Department of Pharmacognosy, University of Zagreb Faculty of Pharmacy and Biochemistry.

as an integral part of coated tablets with small doses of celandine alkaloids that cannot cause acute intoxication (Kuštrak 2005). It is included in the latest edition of the European Pharmacopoeia (European pharmacopoeia 2022).

Current research on celandine (*Chelidonium majus* L.) shows that fresh extracts as well as isolated purified compounds of celandine show a wide range of biological activities (anti-inflammatory, antimicrobial, antitumor, analgesic, hepatoprotective), and its anti-osteoporosis and radiation protective effects have also been scientifically proven. However, the traditional use of this plant also mentions diuretic, antitussive and regenerative effects for the eyes, which is yet to be tested and confirmed in the future. New research that reveals findings about the hepatotoxic effects of celandine renewed the interest of scientists in this plant (Gilcaa et al. 2010; Pantano et al. 2017).

Willow (*De Salice.*) is described as a remedy for ear parasites. The method of preparation of the remedy by grinding and pressing willow wood to obtain an extract is also indicated: *Of Willow. / Those with parasites in their ears should, / Make sure they finely grind some willow wood; / Then pour some of the juice into their ear; / And any kind of worm will disappear.* A solution of willow bark in vinegar is recommended in the recipe for removing warts from the skin: *When willow bark is macerated long, / In vinegar which is extremely strong / This solution when applied, warts begin / To steadily disappear from your skin* (Mediolano's *Flos medicinae*, tr. Pavić 1768, LXX. p. 40).

Willow (*Salix* L. spp.) is traditionally used in folk medicine as a remedy against malaria, fever and rheumatism in the form of

tea and extract, and is a valuable source of biologically active compounds, including the glycoside salicin, the main pharmacologically active metabolite (Mahdi 2010). A synthetic derivative of salicin is acetylsalicylic acid, also known under the brand name *Aspirin*[®]. Recent phytochemical research of willow extract and its pharmacologically active compounds have confirmed its analgesic, anti-inflammatory, antioxidant, anticancer, cytotoxic, antidiabetic and antimicrobial effects, and further research is focused on its hepatoprotective and neuroprotective therapeutic effect (Tawfeek et al. 2021). Willow bark (*Salicis cortex*) today has its own monograph in the European Pharmacopoeia (European pharmacopoeia 2022).

4. Conclusion

Flos medicinae: Regimen sanitates Salernitanum is a set of rules on how to preserve health, on diseases and the use of medicinal plants for medicinal purposes. These health instructions, written in verse, provide a valuable source of information about medieval remedies and medicine based on ancient medical works, including the Christian, religious approach to medical treatment at the time. The Croatian translation of this work is the first printed medical textbook in Croatian, translated from Latin into Croatian by the Franciscan priest Emerik Pavić.

Recipes including medicinal plants of which the majority grows in the area of Croatia (fig, fennel, mallow, sage, nettle, etc.) were selected and analysed in the paper. All of the listed herbal drugs are also used in present phytotherapy, and most of them are included in the monographs of the latest, 11th edition of the European Pharmacopoeia. The researched particularities of the Croatian translation of *Flos medicinae* give an insight into linguistic and botanical specificities as well as the world-view and approach to medical treatment of that era, which is an incentive for further research of this work.

Acknowledgements: The authors greatly acknowledge financial support of the University of Zagreb. We thank Sanda Vladimir-Knežević, Head of the Department of Pharmacognosy of University of Zagreb Faculty of Pharmacy and Biochemistry for her help in collecting images for the paper.

Conflicts of interest: None declared.

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