

Overview of Dioscorides' recipes in Croatian books of folk recipes

Inić, Suzana; Gašparac, Petra

Source / Izvornik: *Die Pharmazie*, 2022, 77, 270 - 277

Journal article, Published version

Rad u časopisu, Objavljena verzija rada (izdavačev PDF)

Permanent link / Trajna poveznica: <https://um.nsk.hr/um:nbn:hr:163:388742>

Rights / Prava: [In copyright](#) / [Zaštićeno autorskim pravom.](#)

Download date / Datum preuzimanja: **2025-03-12**



Repository / Repozitorij:

[Repository of Faculty of Pharmacy and Biochemistry University of Zagreb](#)



Overview of Dioscorides' recipes in Croatian books of folk recipes

S. INIĆ^{1,*} P. GAŠPARAC¹

Received April 22, 2022, accepted July 5, 2022

*Corresponding author: Suzana Inić, University of Zagreb, Faculty of Pharmacy and Biochemistry, A. Kovačića 1, 10000 Zagreb, Croatia
sinic@pharma.hr

Pharmazie 77: 270-277 (2022)

doi: 10.1691/ph.2022.2027

The aim of this paper is to present an overview of Dioscorides' recipes from his work *De materia medica* which are found in Croatian folk medicine preserved in books of folk recipes called *lječkaruše*. The particularities of five published and analysed Croatian books of folk recipes from the 17th and 18th century are examined. Recipes with drugs of herbal and animal origin, which are most often mentioned in Croatian books of folk recipes, and which were available in folk medicine at the time, are compared with those from Dioscorides' work. Many herbal drugs described in books of folk recipes are today used in contemporary phytotherapy, and modern biomedical research reveals new bioactive substances and confirms new and potential biological activities in medicinal plants used in folk medicine, which is the basis for further study of *De materia medica* by Dioscorides and ethnomedicinal collections. Croatian books of folk recipes are a valuable resource for multidisciplinary study, including for medicinal and pharmaceutical historians, philologists and ethnologists.

1. Introduction

Throughout history, pharmacy has developed as an integral part of other sciences including medicine, botany and chemistry. The first forms of medical treatment can be traced back already to the pre-civilisation era when medicine was going through an empirical, demonistic, animistic and magical-religious phase (Schmitz 1998; Glesinger 1954). The oldest data on medicinal plants and their use for medicinal purposes were found in records and on monuments of ancient civilisations (Babylonian-Assyrian, Egyptian, Graeco-Roman, Arab, etc.) (Kuštrak 2005). Ancient Greek medicine, which was not based on faith, magic or superstition, but was in search of natural basis of diseases, their causes and treatment, stands out particularly (Grdinić 2015). The most esteemed and influential ancient physician, pharmaco-botanist and the first true pharmacognosist was Dioscorides (c. AD 60) (Sonnedecker 1976). Many herbal remedies and recipes from his most important and best-known work, *De materia medica*, can be found in medieval European medical manuscripts, whether original or reproduced (Riddle 1981a; Voigts 1979). In Croatia, folk medicine literature has been preserved in books of folk recipes called *lječkaruše*. They describe the use of many medicinal plants described in Dioscorides' work. An overview of Dioscorides' recipes with drugs of herbal and animal origin which appear in five Croatian books of folk recipes from the 17th and 18th century in Latin transliteration and transcription may be used for a more extensive pharmaceutical-historical philological study. Recipes with herbal drugs which are most often mentioned in Croatian books of folk recipes and which grow in the region (St. John's wort, sage, nettle, fennel, rosemary, danewort, plantain, etc.) are compared, as well as the use of some animals and drugs of animal origin (swallows, snails, bile, urine, faeces, etc.) which were part of folk medicine at the time. Special attention was also given to some particularities of the analysed books of folk recipes. Research into them may be a stimulus to discover new therapeutic effects of traditional medicines and reveal new knowledge about their efficacy and safety (Helmstädter and Staiger 2014).

Analysis of ancient texts requires a complex scientific approach. Using modern language translations of ancient plants names is a potential source of error because plant names have changed over time. Therefore, the correct identification of plants according

to modern taxonomy is often difficult because in ancient times the same names could be used for different species (Yarnell and Touwaide 2019). For these reasons, the paper does not always specify a specific plant species. When interpreting the popular names of plants and their synonyms, mentioned in Croatian books of folk recipes, available dictionaries were used (Šulek 1879; Kušan 1956; Skok 1971; Šugar 2008), and the names of plants were associated with their modern Croatian names and Latin names that could correspond to modern taxonomy. At the time of creation of Croatian books of folk recipes, Dioscorides' work was available in Europe in various editions, translations and interpretations (Grdinić 2001). The proximity and maritime trade influence of the then Italy suggests that priests used Latin texts from the area when transcribing recipes. Since the sources in Croatian books of folk recipes vary greatly and since it is very difficult to determine from which transcript or translation Dioscorides' recipes originate, the English translation of Dioscorides' work made from a Latin-17th century Dioscorides translation edited by Tess Anne Osbaldeston (Dioscorides' *De materia medica*, tr. Osbaldeston 2000) was used to compare the recipes. For weights and measures, the English translation of Dioscorides' work from the Greek language was used, ed. by M. Wellmann (1906–1914), translated by Lily Beck (Dioscorides' *De materia medica*, tr. Beck 2005), in which weights and measures (after J. Berendes) used in Dioscorides' work and recipes found in Croatian books of folk recipes are clearly indicated. Many recipes in Croatian books of folk recipes were created by rewriting recipes from various sources and they were often supplemented, adapted and simplified to be more understandable to the people for whom they were intended. The paper selects recipes with plants and herbal and animal drugs that are most common in a particular book of folk recipes or are specific to Croatia, and the recipes textually show the most similarities with those from Dioscorides' work.

1.1. The importance of Dioscorides' "De materia medica"

Pedanius Dioscorides (Pedanius Dioskourides) of Anazarbus (Asia Minor) is the author of *De materia medica* (c. AD 70), the most detailed textbook of pharmacognosy in the ancient Mediterranean region (Riddle 1980). He described about 800 medicines of plant, animal and mineral origin, and over 600 species of plants (Riddle

1981b). In compiling this extensive work, Dioscorides relied on previous records, his experience as a physician and medical tradition of the Mediterranean and the Middle East (Riddle 1985; Scarborough 2012). Although geographical data in *De materia medica* suggest that the work is the result of Dioscorides' extensive travels in Greece, Italy, France and Asia Minor, the literature often cites the controversial view that he travelled as a physician in the Roman army (Riddle 1985; Scarborough and Nutton 1982). However, much of the information is not based on Dioscorides' observation, but on older sources, especially Sextius Niger (Wellmann 1889). The historical relevance of *De materia medica* results from the fact that the work was copied, edited and translated into various languages (Greek, Latin, Arab) (Riddle 1980) and had a major impact on medieval and modern medicine in Europe, as well as on scientists such as Pseudo-Serapion (13th century), Avicenna (980–1037) and Ibn al-Baytar (1197–1248) (Riddle 1981b; Stannard 1966). Thanks to the advent of printing press (15th century) and the printing of books in Renaissance Europe, Dioscorides' work became accessible to the wider public. It was printed in many European languages and remained in use until the end of the 19th century, but not in Western academic medicine (Reeds 1976; Staub et al. 2016; Yarnell and Touwaide 2019).

The work was originally written in Greek and divided into five books. The first book describes aromatic plants, trees and their juices, gums, resins and fruits, oils and vegetable fats. The second book incorporates animals, animal parts, as well as drugs of animal origin (honey, milk, etc.), cereals, vegetables and pungent herbs. In the third book, Dioscorides wrote about roots, juices and seeds. The fourth book describes roots and herbs that had not been previously described, while the fifth discusses medicinal wines, vines and minerals (Scarborough 2012; Grdinić and Kremer 2009). For each mentioned drug, Dioscorides described the site and provided a botanical description, properties, method of preparation, dosage and medicinal use. He also mentioned examples of drug adulteration and the differentiation of pure from adulterated drugs (Grdinić 2001). Dioscorides' recipes and the effects and use of medicinal plants can also be found in Croatian medieval monastic medicine recorded in *ljekaruše*.

2. Croatian books of folk recipes – *ljekaruše*

Oral tradition, ritual and symbolic elements are characteristic of folk medicine. The tradition of Croatian folk medicine has also been preserved in special manuscripts called *ljekaruše*. *Ljekaruše* are recipe collections with instructions for the treatment of humans and animals, often including hygienic and dietary advice, as well as advice for households. They resulted from poor economic, cultural and political conditions in Croatia at a time when conventional medicine was not available to a wide range of people. It is therefore not surprising that they have been preserved mainly in monastic libraries where they were written by priests who represented the most educated portion of the population. They were in contact with poorly educated people in rural areas where these textbooks provided the only form of treatment (Šušnić-Fliker 1986). Monasteries in medieval Europe had access to Greek medical works, and monks translated these works into Latin, thus preserving and spreading ancient Greek medicine throughout Europe (Siraisi 1990).

As a form of medieval medical literature, books of folk recipes are also found in other European countries under different names (*leech books, herbal, antidotaria, receptaria, kräuterbuch*) (Lewis 1914; Luft 2020; Stannard 1974). They represent the transition from folk to conventional medical literature (Thaller 1938). Numerous books of folk recipes have been preserved in Croatia in which evidence of ancient Slavic medicine can be found as well as the influence of ancient, Arab, Byzantine and medieval Salernitan medicine. They were written mostly in the Glagolitic, Latin and Croatian Cyrillic (old Croatian script) script and often supplemented by several authors. They represent an important historical source for the study of folk culture, language, medicine and pharmacy of different time periods in which they were written, transcribed or supplemented (Poljak 2009). The oldest Croatian books of folk recipes date from

the 14th and 15th century and contain various mystical and religious records for disease treatment and prevention, which is understandable because they were created at the time of the domination of the teachings of the church (Dürriegl and Fatović-Ferenčić 2009). Individual records or parts of books of folk recipes can also be found as supplements to religious books and other sources (Dürriegl and Fatović-Ferenčić 1999). Books of folk recipes are usually named after the compiler, transcriber or place where they were written or found, and most were created in the second half of the 18th century and the first half of the 19th century (Brkić Midžić 2017). The oldest known Croatian Glagolitic book of folk recipes from the end of the 14th century, stored in the Croatian Academy of Sciences and Arts, was described and transliterated by Ivan Milčetić (Milčetić 1913).

2.1. Karlobag books of folk recipes

The first Karlobag (Pribimnić's) book of folk recipes (in Croatian, *Prva Karlovaška (Pribimnićeva) ljekaruša*) from 1603 was written on 16 pages in clearly legible Latin handwriting and contains 106 simple instructions for the treatment of humans and animals. The book jacket mentions Karlobag (a town on the Croatian coast), while the third page of the cover bears a drawing of the town fortress, which suggests that the book was written in that town. The writer of this book of folk recipes is known, so it was named *Pribimnić's book of folk recipes* after him. It preserves the old language forms, as well as the vernacular of the time, because it was to serve as a practical and linguistically accessible medical textbook, mainly to the rural population to whom medical care was often inaccessible. The book also includes Glagolitic records, and there are also words originating in other languages (Latin, Italian, German and Hungarian). Chronologically, this is the third oldest preserved book of folk recipes in Croatia, and its value lies in the fact that most recipes in it appear for the first time, so it probably served as a source for other books of folk recipes written after it (Derossi et al. 1984). Other prescriptions were taken from other sources, including eleven recipes from the second oldest preserved Croatian Glagolitic book of folk recipes from the beginning of the 15th century entitled *Various records and spells* (in Croatian, *Razni zapisi i čaranja*), known in the literature as *Strohal's book of folk recipe collections* (after the author who analysed the book) (Strohal 1910). In addition to theurgical, demonistic and magical elements of healing, empirical medicine based on recipes involving medicinal plants nevertheless predominates in *The first Karlobag book of folk recipes*. These are mostly medicinal plants found in Croatian regions which grow naturally or are cultivated for self-medication purposes (sage, fig, camomile, marshmallow, plantain, linden, nettle, rue, hawthorn, etc.) (Poljak 2009). Most of these plants are described as used similar to Dioscorides' work. One of the recipes describes the use of sage to treat dysentery: *To treat dysentery, take sage juice and drink it with white wine – it is a medicine* (Poljak 2009, p. 82) (Fig. 1).

A similar recipe for the use of sage as a remedy is found in Dioscorides where it is used as a diuretic, abortifacient, to treat cough, to treat ulcers, but also for painful spleen and dysentery: *Taken as a drink with white wine it cures a painful spleen and dysentery* (Dioscorides' *De materia medica* III 40 (tr. Osbaldeston [2000], p. 408)). The similarity of these recipes in the use of sage may indicate that the author was familiar with Dioscorides' work or that the recipe was copied from another book of folk recipes that included Dioscorides' recipe. Sage (*Salvia* spp. L.) is a Mediterranean plant whose name is derived from the Latin word *salvare* (to cure or save) and which has been attributed many medicinal properties confirmed in the following proverb: *Cur moriatur homo cui salvia crescit in horto* (Why should a man die whilst sage grows in his garden?) (Fatović-Ferenčić and Dürriegl 1997). In modern phytotherapy, sage leaf is used for rinsing and gargling for the treatment of inflammations of mouth and pharyngeal mucosa, for the treatment of dyspeptic complaints and as an antihydrotic (reduces sweating) (Schaffner et al. 1999). The drug has also been included in the European Pharmacopoeia. In this book of folk recipes we also find recipes that use animals (hedgehog, mole, swallows, bees, snail, worm), their organs (rabbit heart, deer brain and antlers) and

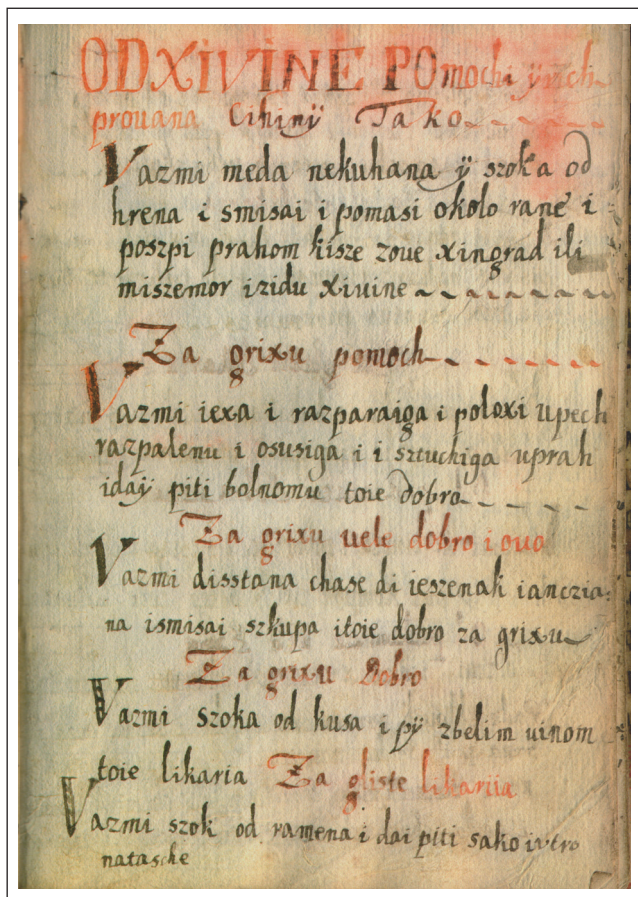


Fig. 1: The original recipe with sage To treat dysentery (*Za grižu dobro*) in *The first Karlobag book of folk recipes* from 1603. The use is written in red, while the content of the recipe is written in black (Poljak 2009, p. 39).

secretions (bile, fat, donkey milk) for healing purposes, which was common in folk medicine at the time. For example, for the treatment of eye diseases (in Croatian, *Za oči likaria koga bole*), the ashes of young swallows are mixed with honey and placed on a clean scarf to cover sore eyes (Poljak 2009, p. 88). We find similarities in Dioscorides' recipe with swallows: ... *the ashes of them and of their female parents burnt in a ceramic pot and rubbed on with honey cause sharpness of sight*. (Dioscorides' *De materia medica* II 60 (tr. Osbaldeston [2000], p. 203)). In the recipe *When a wound cannot heal (Kad rana ne more zarast)*, black snail flesh is applied to the wound so it can heal immediately (Poljak 2009, p. 84). In the second book of his *De materia medica* Dioscorides mentions snail flesh... *pounded into small pieces and applied as a poultice with myrrh and frankincense heals wounds, especially those around the tendons* (Dioscorides' *De materia medica* II 13 (tr. Osbaldeston [2000], p. 187)). Although Dioscorides' recipe is written in a slightly modified form, both recipes have the same indication. Drug dosage in the recipes of *The first Karlobag book of folk recipes* is greatly simplified, the measures for preparations including only *small pot, one bowl* and *as much as one can take with three fingers* (Poljak 2009, p. 83–84). Such a simple approach is inherent in folk medicine.

The second Karlobag book of folk recipes (in Croatian, *Druga karlovačka ljekaruša*) was written at the beginning of the 18th century (1707) in difficult-to-read Latin handwriting, on 18 blank pages following *The first Karlobag book of folk recipes*. Its author is not known, and its language is closer to today's because books of folk recipes have been gradually adapted to more modern language on numerous transcription occasions. By the middle of the 18th century, there were very few such folk medical textbooks in Croatia, which adds value to this book, which is among the first twenty of such books of folk recipes preserved in Croatia. *The second Karlobag book of folk recipes*

contains 56 recipes, 46 of which are for human treatment (for treating worms, rheumatism, fever, toothache, skin diseases, internal diseases, asthma, tuberculosis, etc.), while ten recipes are for veterinary use (for treating worms, rabies, various horse diseases). Most veterinary prescriptions refer to horse diseases, which is not surprising because in rural areas in those days horses were used for land cultivation and transport, and therefore special care was taken of their health. Unlike in *The first Karlobag book of folk recipes*, remedies of animal origin predominate in this book of folk recipes (eggshell and egg white, crab shell, animal horn powder, snails, rabbit skin, fox fat, goat tallow, wolf intestines, milk, honey, honeycomb, wax, donkey milk, woman's milk, etc.), but the use of this recipes is different from that in Dioscorides' work, which suggests that the recipes were taken from other sources or were original folk remedies. Ingredients of plant origin are less represented with mostly domestic medicinal plants: nettle, marshmallow, saffron, wormwood, anise, sage, rue, fennel and other plants used in folk medicine at the time. Nettle (*Urtica* spp. L.) is listed in this book of folk recipes as a cough remedy: *A cough remedy. Good for a cough. Cook nettle seeds with honey and drink that soup as warm as possible before going to bed – the cough will go away.* (Poljak 2009, p. 101). We

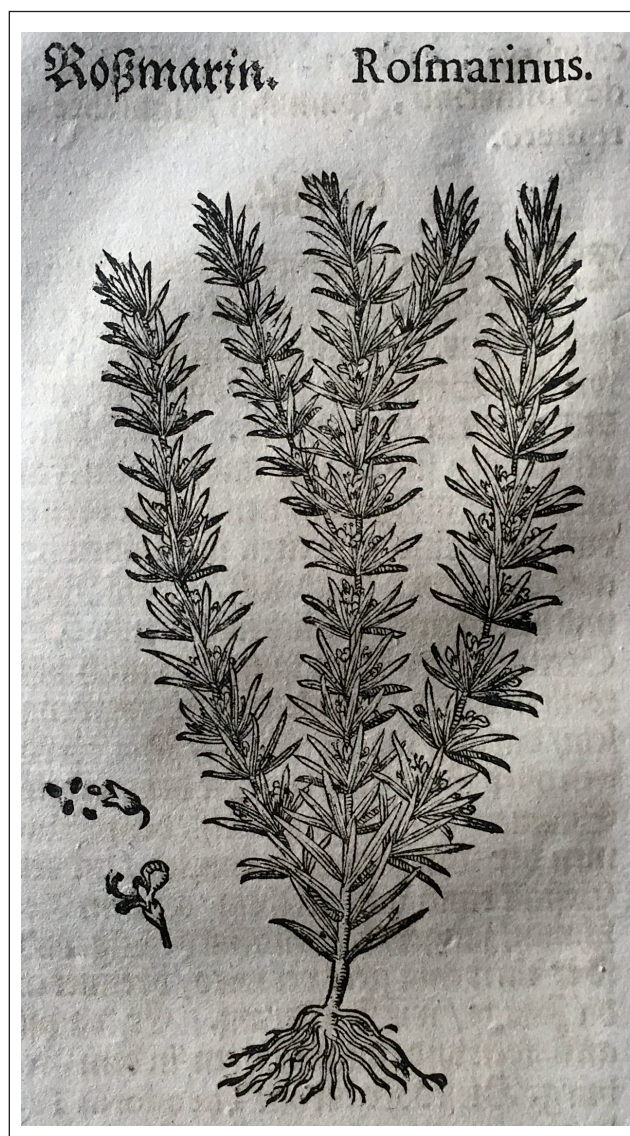


Fig. 2: Rosemary, which is recommended in *The second Karlobag book of folk recipes* as a remedy for all diseases. Taken from: Verzascha B, Matthiolo PA, Camerarium I (1678) *Neu vollkommenes Kräuter Buch: von allerhand Gewächsen der Bäumen...*, Johann Jacob Decker, Basel..., p. 464. The book is kept in the library of the Department of Pharmacognosy, University of Zagreb Faculty of Pharmacy and Biochemistry (FBF).

find similarities in Dioscorides' nettle recipes: ... *Licked in with honey it helps asthma, pleurisy and pneumonia, and fetches up stuff out of the chest.* (Dioscorides' *De materia medica* IV 94 (tr. Osbaldeston [2000], p. 644)). Nettle herba is used as a herbal diuretic in modern phytotherapy, and has anti-inflammatory and anti-rheumatic effects (Wichtl 2001). Rosemary (*Rosmarinus officinalis* L.) has a particularly important place in recipes with herbal drugs. Although it is not mentioned in *The first Karlobag book of folk recipes*, by the time of *The second Karlobag book of folk recipes* rosemary had become a universal remedy for all diseases: *The healing power of rosemary* (in Croatian, *Od moći ku ima rusmarin*). *Tie its flower in a clean handkerchief, put the flower in a jug of fresh water, leave it until midnight, then drain it and drink that water on an empty stomach. It is a remedy for every disease* (Poljak 2009, p. 102). In other recipes it is used as a remedy for the treatment of cough (*Od kašlja likarija*), tuberculosis (*Od jetike*), asthma (*Od siputi likaria*), abdominal pain (*Od obrasti terbuha lik*), malaise (*Od mlednosti glave i života*), and as a stomachic (*Ki jist ne more*). It is even recognised to have a magic effect against witches and various ghostly creatures. Rosemary (Fig. 2) is an aromatic Mediterranean plant whose name is of Latin origin, *ros marinus*, which means sea dew. In ancient times, it was used to improve memory and to prevent nightmares by putting it under a pillow (Kumar 2016).

Its healing properties were recognised by ancient botanists and physicians Theophrastus and Dioscorides, who writes the following in *De materia medica*: *Libanotis (Greek) the Romans call rosmarinus and those who plait wreaths for the head use it... It is warming and cures jaundice. It is boiled in water and given to drink before exercises, and then he who exercises bathes and is drenched with wine. It is also mixed with remedies for the removal of fatigue...* (Dioscorides' *De materia medica* III 89 (tr. Osbaldeston [2000], p. 467)). In ancient Greece, rosemary was dedicated to Aphrodite, the goddess of love and beauty, so even today in folk tradition a sprig of rosemary is an ornament on the clothes of newly-weds and wedding guests (Dugački 2009). Today we know that rosemary leaf is an essential oil-bearing drug, with a monograph in the European Pharmacopoeia, and is used as a carminative, stimulates the secretion of gastric juices, improves blood circulation and helps treat rheumatic diseases (Willfort 1978). In *The second Karlobag book of folk recipes*, in addition to simple measures such as bowls, cups and scoops, measures used in pharmacy are introduced for the preparation and dosing of drugs, such as the *uncia* (an ancient Roman unit of weight) and *drachm* (an ancient unit of weight): *The one who has quartan fever* (a form of malaria where an onset of fever occurs in an interval of four days) *should drink one drachm of deer antler powder mixed in white wine two hours before the fever to get well* (Poljak 2009, p. 100). The recipes in *De materia medica* use simple measures such as a cup, a teaspoon and a quantity equivalent to a few grains of a cereal, which correspond to measures such as *ceration* (0.189 g), *gramma* (1.137 g), *drachme* (3.411 g), *xestes* (54.58 g / 0.547 L), *mystron* (0.068 L), *cochlarion* (0.012 L) *cyathos* (0.0456 L) and other measures mentioned in the book (Dioscorides' *De materia medica* III 33 (tr. Beck [2005], p. xii)).

2.2. Folk-medicine book of Don Petar Kaštelan

The book of folk recipes entitled *Folk-medicine book* (in Croatian, *Libar od likarij*) dates back to 1779 and contains 108 pages handwritten in Croatian Cyrillic. It was written in the language still spoken to this day by the inhabitants of Poljica (a region in Dalmatia near Split). The author of this book is a Franciscan Catholic priest Don Petar Kaštelan, who in his introductory note writes that the book is actually a transcript of a manuscript from 1765, while the original printed Latin text dates back to 1646. Many of the recipes appear also in other books of folk recipes from the region (Medić 1909), so it can be assumed that the same Latin text or its transcript was used as a basis for writing, transcribing and/or supplementing these books.

Folk-medicine book of Don Petar Kaštelan consists of 260 recipes for human use. The largest number of recipes (209) refers to experiential therapy, mainly involving the use of domestic medicinal plants, and to a lesser extent the use of ingredients of animal and mineral origin (Kujundžić et al. 2008). In this book of folk recipes we can also find more complex recipes whose individual ingredients or preparations must be purchased at a pharmacy (the term used in the book is *spicijalija*), such as an aloe preparation or red lead pigment ointment for the treatment of diseased spleen (Kujundžić et al. 2011, p. 64), camphor-turpentine ointment for wound healing (Kujundžić et al. 2011, p. 60), and other ingredients and medicinal preparations that could only be purchased at a pharmacy. This suggests that these recipes come from a pharmacy textbook used by pharmacies at the time to make their own preparations. The recipe entitled *Wound remedies that can be found in pharmacies* (in Croatian, *Stvari za ranu mnogo vridne naode se u spicijaliji*) lists St. John's wort oil (*Hypericum perforatum* L.) and red lead pigment ointment as ingredients applied to fresh wounds (Kujundžić et al. 2011, p. 59). In Dioscorides' *De materia medica*, St. John's wort has a diuretic effect, it regulates menstruation, treats fever and sciatica, and heals burns: *The leaves (applied together with the seed) heal burns* (Dioscorides' *De materia medica* III 171 (tr. Osbaldeston [2000], p. 537)). Modern phytotherapy also mentions the use of St. John's wort for the treatment of wounds, mild burns and myalgia as well as its use as an herbal antidepressant (Apaydin et al. 2016; Ng et al. 2017). Interestingly, two recipes also mention *theriac*, a remedy that was considered a universal panacea and antidote from the time of its original formulation in the 2nd century BC to the mid-18th century (Griffin 2004). In this book of folk recipes it is listed as an antidote that can be obtained only at a pharmacy: *For poisons. Get yourself theriac, a snake ointment that can be found in a pharmacy...* (Kujundžić et al. 2011, p. 72) (Fig. 3).

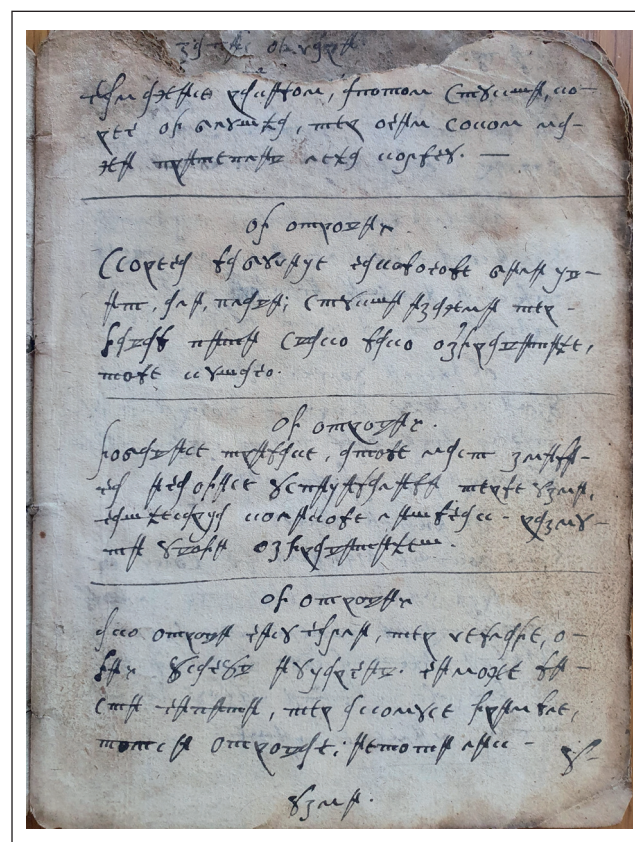


Fig. 3: Original recipes from *Folk-medicine book of Don Petar Kaštelan* prescribing antidotes, including *theriac*, a universal remedy for all poisons. The book is kept in the Lukin family collection.

Also, Dioscorides includes vipers' flesh in his work, a well-known antidote at the time and a remedy for longevity: ... *Some again say that those who eat them are longlived*. Vipers' flesh was also recommended for improving eyesight and in the treatment of tendons and swellings: *The flesh of the viper (boiled and eaten) makes the eyes quick-sighted and is also good for disorders of the nerves. It represses enlarging scrofulous tumours [glandular swelling, goitres]*. (Dioscorides' *De materia medica* II 18 (tr. Osbaldeston [2000], p. 188–189)). A large number of recipes in this book (49) refer to women's problems related to infertility (a woman who cannot have children, *Žena koja ne ima dce*), childbirth (a woman who cannot give birth to a child, *Koja žena ne more poroditi dite*), lactation (A woman who cannot produce milk, *Koja žena ne ima mlika*) and menstrual disorders (to make a woman stop bleeding, *Ženi učiniti da pristane karvotočje*), which gives us an insight into the frequency and prevalence of these problems at the time of writing. In several recipes for stimulating lactation in women, the use of fennel (*Foeniculum vulgare* Mill.) is recommended: *A woman who cannot produce milk. Cook barley and fennel seeds and drink cold. Your condition will improve, it has been tried* (Kujundžić et al. 2011, p. 104). An almost identical recipe can be found in *De materia medica* where Dioscorides writes for fennel: *Marathrum (the herb itself), eaten, is able to draw down milk (in breastfeeding), as does the seed taken in a drink or boiled together with barley water*. He also mentions the use of fennel as a diuretic, for the treatment of fever, nausea in the stomach and eye diseases, but also for women's menstrual problems: *Taken as a drink with cold water it expels the menstrual flow ... s*(Dioscorides' *De materia medica* III 81 (tr. Osbaldeston [2000], p. 456)). We also find this in *Folk-medicine book of Don Petar Kaštelan* where crushed fennel seeds in white wine have the same indication for use (a woman who stops bleeding, *Kojoj ženi cvit stane*) (Kujundžić et al. 2011, p. 98). The Greek name for fennel is *marathon*, and 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 we know that fennel fruit (*Fructus foeniculi*) is used in conventional medicine as an expectorant, spasmolytic and carminative and is valued in paediatric practice for relieving infant colic and as a secretolytic expectorant (Wichtl 2001). The following ingredients of animal origin are mentioned in *Folk-medicine book of Don Petar Kaštelan*: animals (rabbit, frog, ants, snakes, lizard), body parts or certain organs (cow hoof and udder, rabbit skin, sparrow heart, etc.) and animal excreta and secretions (pork fat, blood, bile, milk, honey, wax, eggs, etc.). The recipe entitled *To make hairs grow (Za učiniti da vlasi niknu)* includes frog ashes mixed with honey to treat baldness: *Fry three live tree frogs in a pan until you make ashes, mix it with honey, and smear the scalp with it in places where you want hairs to grown*. (Kujundžić et al. 2011, p. 57). In Dioscorides' work, frogs are antidotes to snake bites, when burnt, they stop bleeding, treat toothache, and can also be used to treat baldness: *They cure alopecia [baldness] rubbed on with liquid pitch* (Dioscorides' *De materia medica* II 28 (tr. Osbaldeston [2000], p. 194)). This recipe coincides with the one from the book of folk recipes, so it is likely that *De materia medica* was one of the sources used in compiling the original Latin text, which was later transcribed and supplemented.

2.3. The Great Sinj Book of Folk Recipes

This manuscript collection was created in the middle of the 18th century. It contains about 1,700 recipes (the original contained additional 150 pages now missing), and is therefore called *The Great Sinj Book of Folk Recipes* (in Croatian, *Velika sinjska ljekaruša*). The author of the text is unknown, and the transliteration from Croatian Cyrillic to Latin script was made by the priest Stanko Petrov from the Franciscan monastery in Sinj (a town in Central Dalmatia). The language in which it was written is still used today by the older rural population of the area around Sinj. The recipes found in this book of folk recipes come from various sources, from ancient, medieval to folk medical records. They were mostly copied from other books of folk recipes and various

medical textbooks and books available to the author. Some recipes include the names of the original compilers. Among them, Pliny the Elder (AD 23/24 –79) (35 recipes), Dioscorides (25 recipes) and Plato (428/427 or 424/423 BC–348/347 BC) (17 recipes) are mentioned most often (Kujundžić 2014). The value of this book of folk recipes was also recognised by Antun Vrgoč (1881–1949), former university professor of pharmacognosy, later Dean of University of Zagreb Faculty of Pharmacy and student of the famous professor of pharmacognosy Alexander Tschirch (1856–1939), with whom he remained friends for years (Inić et al. 2015). In correspondence with Fra Stanko Petrov, Vrgoč stated that the original text of *The Great Sinj Book of Folk Recipes* originated from Latin medical books: *R. D. Caroli Musitani Philosophi, Ac Medici Experientissimi, & Celeberrimi Opera Medica Chymico-Practica, Seu Trutina Medico-Chymica: In III. Partes divisa* from 1701 by Carlo Musitano (1635–1714), *Magia Naturalis (Natural Magic)* from 1560 by Giambattista della Porta (1535–1615), *Opera omnia medico-practica et anatomica* from 1738 by Giorgio Baglivi (1668–1707) and *Tractatus de viribus medicamentorum* from 1726 by Hermann Boerhaave (1668–1793). Vrgoč spent years researching Croatian folk medicine and discovered the great influence of Dioscorides and Pliny in the manuscript collections of folk recipes (Vrgoč 1936). In his research of *The Great Sinj Book of Folk Recipes*, as part of the study of several Croatian books of folk recipes, he encountered numerous linguistic ambiguities related to archaic folk expressions and words from Dalmatian vernacular due to which his research took much longer and remained unfinished because of his death (Kujundžić 2014). This book of folk recipes is unique in that the recipes are classified into thirty chapters by individual groups of diseases or symptoms most often described by the name of the diseased organ: A chapter on head (*Od glave poglave*), A chapter on nosebleed (*Od krvi iz nosa poglave*), A chapter on teeth (*Od zubi poglave*), A chapter on bowels (*Od utrobe poglave*), A chapter on conception (*Od začeca ženskoga poglave*) and other chapters for various health problems. We do not find such systematisation in other Croatian books of folk recipes. It was probably made, although not always consistently, to navigate more easily through the numerous recipes contained in *The Great Sinj Book of Folk Recipes*. For these reasons, the textbook includes a kind of an index entitled *Index, which is found in this book in each chapter for different reasons* (in Croatian, *Tabula od skazana, što se uzdrži u ovi kniga u svakom poglavju različito po razlozi*). Most of the ingredients used in the recipes are easily available in a household, allowing easier preparation and use for the population, mostly rural, for whom these preparations were intended in the first place. However, *materia medica* of this book of folk recipes contains also other ingredients that come from all over the world, such as aloe (*Aloe* spp.), true cinnamon tree (*Cinnamomum* spp. Schaeff.), ginger (*Zingiber* spp. Boehm.), myrrh (*Commiphora* spp. Jacq.) and other herbal drugs. This is not surprising because this book was compiled, transcribed and supplemented from various sources. Among the herbal drugs which are the main raw materials in the recipes, the most common are domestic medicinal plants: marshmallow and high mallow, sage, almond, chard, broad bean, basil, black pine, immortelle, nettle, fennel, comfrey, rosemary, yarrow, danewort, saffron, linden, olive, ivy, turnip, asparagus, rue, peppermint and many others. Some recipes cite Dioscorides' name as a confirmation of successful treatment. For example, the chapter on the treatment of gout and other skeletal diseases lists several recipes which are claimed to be recommended by Dioscorides. They include a recipe with horse fat and danewort (*Sambucus ebulus* L.), which are mixed and applied in the form of an ointment to a painful spot: ... *Use that ointment to smear the sore spot, and something surprising will happen, says Dioscorides* (Kujundžić 2014, p. 111). In *De materia medica* Dioscorides notes the following for the leaves of danewort: ... *Smeared on with bull or goat grease they heal hollow ulcers, and help gout* (Dioscorides' *De materia medica* IV 175 (tr. Osbaldeston [2000], p. 729–730)) (Fig. 4).

Small differences in the ingredients of the remedy (horse fat instead of bull or goat grease) probably occurred when *The Great Sinj*



Fig. 4: Danewort, a traditional medicinal plant that today has the potential for new therapeutic effects. Taken from: Matthioli PA (1568) I discorsi di M. Pietro Andrea Matthioli sanese ...nelli sei libri di Pedacio Discoride Anazarbeo della materia medicinale.... Venezia, p. 1333. Courtesy of the library of the Department of Pharmacognosy, FBF.

Book of Folk Recipes was transcribed or supplemented because ingredients that were available in a household were often used. In this book of folk recipes, danewort is a remedy ingredient in many recipes (24), and it is still used in folk medicine in many parts of the world for the treatment of various diseases, including: joint pain, cold, wounds and infections. Today, efforts are being made to prove its potential for other therapeutic effects, such as the treatment of cancer and metabolic disorders (Jabbari et al. 2017). Many Dioscorides' traditional remedies with ingredients of animal origin also appear in this book of folk recipes: *Donkey urine is a good gout remedy, as confirmed by Dioscorides* (Kujundžić 2014, p. 123). This recipe, however, has a different indication in Dioscorides' work and is intended for the treatment of kidney disease: *Urine of an ass is said to cure inflamed kidneys* (Dioscorides' *De materia medica* II 99 (tr. Osbaldeston) [2000], p. 225)). By comparing the recipes from *The Great Sinj Book of Folk Recipes* which mention Dioscorides' testimony with those from *De materia medica*, it can be concluded that mostly recipes with ingredients of animal origin were taken including: sheep, goat and horse fat, chicken, bull and partridge bile, donkey liver, snake fat, frog and deer body parts, raw eggs, etc. In some of these recipes, the ingredients or indications for use were changed or added, which is not surprising because during collections and transcriptions the recipes were very often adapted to the area in which a book of folk recipes was created and the people for whom it was intended.

2.4. Medicine books. Which grass is good for what.

The book of folk recipes entitled *Medicine books. Which grass is good for what.* (Croatian, *Knjige od likarije. Koja je trava za što dobra.*) was found in Omiš (a town in Dalmatia at the mouth of the river Cetina), so it was also named *The Omiš book of folk recipes* (Croatian, *Omiška ljekaruša*) (Grmek 1963). It was not dated, but

it was later added to the cover in Latin script that the book was written in the 18th century in Croatian Cyrillic. This book of folk recipes contains 48 pages. The third page reads: *This is an introduction to a medical text which includes many things and needs fit for human, translated from Latin into our language*, which clearly indicates that this is a translation of an older Latin text of medical content (Fig. 5).

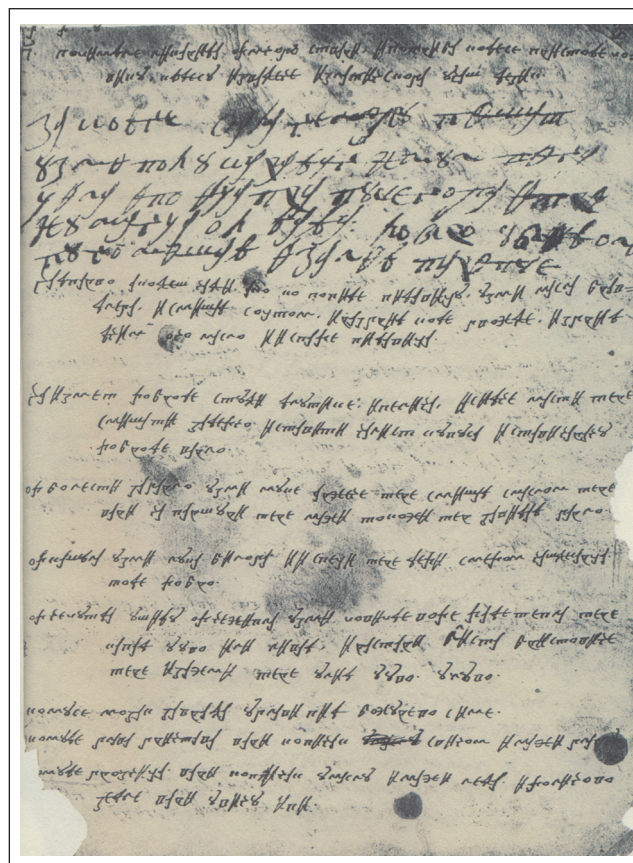


Fig. 5: The third page of *Medicine books. Which grass is good for what.* on which the description of recipes translated from the original Latin text begins. Taken from: Nazor (2010) Two books of folk recipes stored at the Division for the History of Medical Sciences of the Institute for the History and Philosophy of Science, Croatian Academy of Sciences and Arts. In: Pečina M, Fatović-Ferenčić (eds.) *Medicine books. Facsimile and analysis of two books of folk recipes written in Croatian Cyrillic. Rasprave i grada za povijest znanosti, knjiga 10*, Hrvatska akademija znanosti i umjetnosti, Zagreb, p. 17.

Around 260 recipes were written for the treatment of many diseases and conditions in humans, including: cough, bleeding from a wound, broken bones, headache, dizziness, earache, leg pain and abdominal pain, toothache, infertility, hair loss, fever, insomnia, dysentery and many more. The medieval, holistic approach to healing, characteristic to many books of folk recipes, encompasses the healing of both body and soul, including the intertwining of empirical medicine and magic. There are only few such recipes in this book, and they refer to abstract instructions for protection against lightning, for protection against snakes and scorpions, for bird catching, for protection against thieves, as well as to prayers for healing (Nazor 2010). The recipes mostly include domestic herbal drugs that can be found in nature and in the garden: onion, wormwood, cabbage, peony, rue, bay laurel, ash, mint, fennel, poppy, parsley, dill, rose hip and other medicinal herbs. The particularity of this book of folk recipes is the intertwining of two types of recipes. In some recipes a disease or an ailment is mentioned at the beginning, followed by the use of a specific herbal drug for its treatment. The second type of recipes first indicates a medicinal plant, and then its use in different formulations for various disorders. This is similar in structure to *De materia medica*. Such an example are recipes with broadleaf plantain (*Plantago major*



Fig. 6: Iris, the first medicinal plant listed in Dioscorides' *De materia medica*. The description of the herbal drug emphasizes the quality of the Illyrian iris (the area of today's Croatia). Taken from: Matthioli PA (1568) *I discorsi di M. Pietro Andrea Matthioli sanese...nelli sei libri di Pedacio Discoride Anazarbeo della materia medicinale...*, Venezia, p. 18. In Matthioli's book, iris is called *Iride domestica*. The book is kept in the library of the Department of Pharmacognosy, FBF.

L.) on two pages for various diseases and ailments entitled *The Power of Plantain* (*Od kriposti bokvice*). ...It will draw out pus from a wound, and it is good to mash it, mix it with honey and apply the mix to the wound... For the treatment of earache. Mash plantain leaves and put a few drops of the juice into the ear. It will also clean and heal scabs... Apply its juice on your swollen eyes... It is also good for painful, bleeding or swollen gums. For a fever. If you have a fever, boil three plantain roots, three glasses of water and three glasses of wine in a pot... and drink it before you start shaking (Nazor 2010, p. 71–72). Dioscorides' work includes almost identical recipes and indications for the use of plantain: ... it heals skin inflammation, and helps fistulas (ulcers) poured into them. The juice being dropped in the ears or mixed in eye salves helps earache and sores on the eyes, and it is good (taken as a drink) for bleeding gums and for those who vomit blood. ...some say that three roots (taken as a drink with three cupfuls of wine and as much water) help a fever with recurrent paroxysms and that four roots (help) a quartain [with paroxysms every fourth day] fever (Dioscorides' *De materia medica* II 153 (tr. Osbaldeston [2000], p. 276–280)). Today we know that broadleaf plantain leaf has a number of biologically active compounds, such as polysaccharides, lipids, caffeic acid derivatives, flavonoids, iridoid glycosides, terpenoids, alkaloids and some organic acids. Further research should contribute to a more complete picture of its biological activities, including wound healing activity, anti-inflammatory, analgesic, antioxidant, weak antibiotic, immune modulating and antiulcerogenic activity (Samuelsen 2000). This book of folk recipes also mentions several recipes with rosemary, including *The Power of Rosemary* (*Od kriposti rusmarina*), in which it is

mentioned as a cure for all diseases (Nazor 2010, p. 64). This recipe is actually identical to the one in *The second Karlobag book of folk recipes* in which a transcript of the same original Latin text was probably used. One of the particularly highlighted medicinal drugs in this book is the root of iris, which has several indications for use: for easing cough, for blood circulation and heart diseases, for the treatment of chest pain and gastric distress. Iris (*Iris* spp. L.) is a plant whose name derives from the Greek word for rainbow alluding to the wide colour variety of its flowers. Dioscorides begins his *De materia medica* with it. He points out that the best iris root is from Macedonia and Illyria (in ancient times this was the region that included today's Croatia) (Dioscorides' *De materia medica* I 1 (tr. Osbaldeston [2000], p. 1–2)) (Fig. 6). According to current understanding, this synonym would be *Iris pallida* subsp. *illyrica* (Tomm. ex Vis.) K. Richt (<https://euoplusmed.org>).

In his work Dioscorides writes the following about the roots of iris: ... With honey they fill up bare bones with flesh. ... This recipe is also included in *Medicine books. Which grass is good for what: The power of iris...* When there is no flesh on a bone and the bone is bare, sprinkle this powder with honey on the bone. It will fill up the bone with flesh... (Nazor 2010, p. 66–67). This book of folk recipes also contains recipes with ingredients of animal origin: kidney, brain, liver, heart, horns and antlers, teeth and other animal parts, their secretions (bile, milk) and excreta (fat, faeces). Dog faeces are mentioned as a wound remedy: *If you are bitten by a rabid dog, smear dog faeces on the wound...* (Nazor 2010, p. 67). Dioscorides' recipe with dog faeces reads as follows: ... That of men (new-made, applied as a poultice) keeps wounds from inflaming; and it closes open cuts and joins them together... For the treatment of gout, Dioscorides recommends goat faeces: ... Applied with swines' grease they help the gouty... (Dioscorides' *De materia medica* II 98 (tr. Osbaldeston [2000], p. 222–223)). In combination with vinegar, honey and flour, goat faeces have the same use in this book of folk recipes (for the treatment of swollen legs and hands, *Komu noge otiču i ruke*) (Nazor 2010, p. 67). Although in Dioscorides' work this remedy is included as a traditional medicine, today it is known that anal secretions of animals (musk, castoreum, hyraceum, etc.) are used in the perfume industry (Olsen et al. 2007), and some have been replaced by synthetic alternatives (Kraft 2005). In human medicine, faecal microbiota transplantation is used today in patients with recurrent infection caused by *Clostridium difficile* when conventional antimicrobial therapy is not successful (Chapman et al. 2016; Quraishi et al. 2017).

Auxiliary ingredients such as vinegar, honey, wine, brandy, oil and water are found in most Croatian books of folk recipes, and they could be found in every household. They were used to make the preparation of remedies as simple and accessible as possible to the population of poor, rural areas, where self-medication based mainly on folk medicine prevailed as physicians were hard to reach at the time, and their services were expensive.

3. Conclusion

Croatian folk medicine has been preserved in books of folk recipes called *ljekaruše*. They contained simple instructions for the preparation of remedies and their use in the treatment of humans and animals. Although the oldest known Croatian books of folk recipes date back to the 14th and 15th centuries, most of them were created in the 18th and 19th centuries. They were written mainly by priests who had access to ancient, Byzantine, Arab and medieval medical works or their transcripts. Dioscorides' *De materia medica* is one of the most important ancient medical works, and many herbal and animal drugs from this book found similar use in the recipes of five published and described Croatian books of folk recipes from the 17th and 18th centuries. Although Dioscorides' work, as well as Croatian books of folk recipes, include some herbal drugs that have no medical value today, many of them are used in modern phytotherapy, and some have the potential for further biomedical research. Each of the researched books of folk recipes has its own ethnomedicinal particularities. Due to the linguistic and cultural specificities of these books that outline the time and place of their

origin, they should be studied multidisciplinary, including the work of philologists, ethnologists, and medicinal and pharmaceutical historians.

Acknowledgements: The authors greatly acknowledge financial support of the University of Zagreb. We thank Mr Josip Lukin, owner of the original *Folk-medicine book of Don Petar Kaštelan* and Sanda Vladimir-Knežević, Head of the Department of Pharmacognosy of University of Zagreb Faculty of Pharmacy and Biochemistry, for their help in collecting images for the paper.

Conflicts of interest: None declared.

References

- Apaydin, EA, Maher AR, Shanman R, Booth MS, Miles JNV, Sorbero ME, Hempel S (2016) A systematic review of St. John's wort for major depressive disorder. *Syst Rev* 5: 148.
- Brkić Midžić S (2017) Catalogue of the folk medicine collection of the Croatian Museum of Medicine and Pharmacy of the Croatian Academy of Sciences and Arts. In: Pečina M, Fatović-Ferenčić S (eds.) *Folk medicine. Sources and research. Rasprave i grada za povijest znanosti, knjiga 17*, Hrvatska akademija znanosti i umjetnosti, Zagreb, p. 329.
- Chapman BC, Moore HB, Overbey DM, Morton AP, Harnke B, Gerich ME, Vogel JD (2016) Fecal microbiota transplant in patients with *Clostridium difficile* infection. *Journal of Trauma and Acute Care Surgery* 81: 756–764.
- Derossi J, Dugački V, Rukavina A (1984) Karlobag book of folk recipe collections from 1603. In: Glavičić A (ed.) *Senjski zbornik 10–11*: 123–130.
- Osbaldeston TA (tr.) (2000) *De materia medica: being an herbal with many other medicinal materials: written in Greek in the first century of the common era: a new indexed version in modern English*, IBIDIS, Johannesburg.
- Dioscorides of Anazarbus P. Beck LY (tr.) (2005) *De materia medica*, Olms-Weidmann, Hildesheim.
- Dugački V (2009) *Rosmarini laudatio*. In: Pečina M, Fatović-Ferenčić S (eds.) *Karlobag books of folk recipe collections. Rasprave i grada za povijest znanosti, knjiga 9*, Hrvatska akademija znanosti i umjetnosti, Zagreb, p. 137–139.
- Dürriegl M-A, Fatović-Ferenčić S (1999) *Marginalia miscellanea medica in Croatian Glagolitic monuments: a model for interdisciplinary investigations. Viator* 30: 383–396.
- Dürriegl M-A, Fatović-Ferenčić S (2009) Croatian books of folk recipe collections between medicine, religion and literature. In: Pečina M, Fatović-Ferenčić S (eds.) *Karlobag books of folk recipe collections. Rasprave i grada za povijest znanosti, knjiga 9*, Hrvatska akademija znanosti i umjetnosti, Zagreb, p. 141–148.
- Fatović-Ferenčić S, Dürriegl M-A (1997) *Za zubi pomoć – odontological texts in Croatian Glagolitic manuscripts. Acta Stomatol Croat* 31: 229–236.
- Glesinger L (1954) *Medicine through centuries*, Zora, Zagreb, p. 11–18.
- Grđinić V (2001) *Illustrated history of pharmacopoeia*, Medika, Zagreb, p. 463.
- Grđinić V, Kremer D (2009) *Medicinal herbs and drugs: pharmacotherapeutic, botanical and pharmaceutical data*, Hrvatska ljekarnička komora, Zagreb, p. 519–520.
- Grđinić V (2015) *Chronology of pharmacy*, Hrvatska ljekarnička komora, Zagreb, p. 109–110.
- Griffin JP (2004) Venetian treatise and the foundation of medicines regulation. *Br J Clin Pharmacol* 58: 317–325.
- Grmek MD (1963) A collection of old medical, mathematical, physical, astronomical, chemical and natural science manuscripts preserved in Croatia and Slovenia. In: Grmek MD (ed.) *Rasprave i grada za povijest nauka, knjiga 1*, Jugoslavenska akademija znanosti i umjetnosti, Zagreb, p. 311.
- Helmstädter A, Staiger C (2014) Traditional use of medicinal agents: a valid source of evidence. *Drug Discov Today* 19: 4–7.
- https://europepmc.org/edm_dataportal/taxon/57781a07-0ca1-4967-b793-1281fa2ca1/synonymy?highlight=a199e72-82%204cfe-96d9-f221cca0c5aa&accepted-For=829e72a1-9928-4cfe-96d9-f221cca0c5aa&829e72a1-9928-4cfe-96d9-f221cca0c5aa%20usp, Euro+Med Plantbase.
- Inić S, Fatović-Ferenčić S, Kujundžić N (2015) Humanities as a means of survival: the testimony of a Siberian prisoner of war in the first world war. *Acta Med Hist Adriat* 13 (Suppl. 1): 31–48.
- Daneshfard B, Emtiazy M, Khiveh A, Hashempour MH (2017) Biological effects and clinical applications of dwarf elder (*Sambucus ebulus* L.). *J Evidence-Based Complement Altern Med* 22: 996–1001.
- Kraft P (2005) *Aroma chemicals IV: musks*. In: Rowe DJ (ed.) *Chemistry and technology of flavours and fragrances*, Oxford, Blackwell, p. 143–168.
- Kujundžić N, Glibota M, Škrobonja A, Gašparac P (2008) Manuscript containing a collection of medical recipes written in 1776 by a catholic priest Petar Kaštelan of Croatia. *Acta Med Hist Adriat* 6: 15–40.
- Kujundžić N, Škrobonja A, Glibota M, Gašparac P (2011) *Folk-medicine book of don Petar Kaštelan*, Hrvatsko znanstveno društvo za povijest zdravstvene kulture, Rijeka.
- Kujundžić N (2014) *The Great Sinj book of folk recipes: analysis, transliteration and facsimile*, Farmaceutsko-biokemijski fakultet Sveučilišta u Zagrebu, Hrvatska akademija znanosti i umjetnosti – Razred za medicinske znanosti – Odsjek za povijest medicinskih znanosti Zavoda za povijest i filozofiju znanosti, Ogranak Matice hrvatske Sinj, Zagreb, p. 7–51, 95–101.
- Kumar V, Marković T, Emerald M, Dey A (2016) Herbs: composition and dietary importance. In: Caballero B, Finglas PM, Toldrá F (eds.) *Encyclopedia of food and health*, Elsevier, Academic Press, Oxford, p. 332–337.
- Kušan F (1956) *Medicinal and other useful herbs*, Poljoprivredni nakladni zavod, Zagreb.
- Kuštrak D (2005) *Pharmacognosy – phytopharmacy. Golden marketing–Tehnička knjiga*, Zagreb, p. 11–24.
- Liddell HG, Scott R, Stuart Jones H, McKenzie R (rev.) (1940) *A Greek-English lexicon*, Clarendon Press, Oxford.
- Lewis T (ed.) (1914) *A Welsh leech Book, or Llyfr o feddyginiaeth*, D. Salesbury Hughes, Liverpool.
- Luft D (2020) *Medieval Welsh medical texts, vol. 1: the recipes*, University of Wales Press, Cardiff.
- Medić M (1909) Four books of folk recipes. In: Boranić D (ed.) *Zbornik za narodni život i običaje Južnih Slavena* 14: 171–199; 253–273.
- Milčetić I (1913) Old Glagolitic recipes, exorcisms and records. *Vjesnik Staroslavenske akademije* 1: 61–69.
- Nazor A (2010) Two books of folk recipes stored at the Division for the History of Medical Sciences of the Institute for the History and Philosophy of Science, Croatian Academy of Sciences and Arts. In: Pečina M, Fatović-Ferenčić (eds.) *Medicine books. Facsimile and analysis of two books of folk recipes written in Croatian Cyrillic. Rasprave i grada za povijest znanosti, knjiga 10*, Hrvatska akademija znanosti i umjetnosti, Zagreb, p. 9–14.
- Ng QX, Venkatanarayanan N, Ho CYX (2017) Clinical use of *Hypericum perforatum* (St John's wort) in depression: a meta-analysis. *J Affect Disord* 210: 211–221.
- Olsen A, Prinsloo LC, Scott L, Jäger AK (2007) Hyraceum, the fossilized metabolic product of rock hyraxes (*Procavia capensis*): shows GABA-benzodiazepine receptor affinity. *South Afr J Sci* 103: 437–438.
- Poljak Ž (2009) Karlobag books of folk recipe collections from 1603 and 1707 with facsimile and transliteration. In: Pečina M and Fatović-Ferenčić S (eds.) *Karlobag books of folk recipes. Rasprave i grada za povijest znanosti, knjiga 9*, Hrvatska akademija znanosti i umjetnosti, Zagreb, p. 9–23.
- Quraishi MN, Widlak M, Bhala N, Moore D, Price M, Sharma N, Iqbal TH (2017) Systematic review with meta-analysis: the efficacy of faecal microbiota transplantation for the treatment of recurrent and refractory *Clostridium difficile* infection. *Aliment Pharmacol Ther* 46: 479–493.
- Reeds KM (1976) Renaissance humanism and botany. *Ann Sci* 33: 519–542.
- Riddle JM (1980) *Dioscorides*. In: Cranz FE, Kristeller PO (eds.) *Catalogus translationum et commentariorum: Mediaeval and Renaissance Latin translations and commentaries, vol. 4., The Catholic University of America Press, Washington DC*, p. 1–145.
- Riddle JM (1981a) Pseudo-Dioscorides' "Ex herbis femininis" and early medieval medical botany. *J Hist Biol* 14: 43–81.
- Riddle JM (1981b) *Dioscorides*. In: Gillespie CC (ed.) *Dictionary of scientific biography, vol. 4*, Charles Scribner's Sons, New York, p. 119–123.
- Riddle JM (1985) *Dioscorides on pharmacy and medicine*, University of Texas Press, Austin, p. 2–4.
- Samuelsen AB (2000) The traditional uses, chemical constituents and biological activities of *Plantago major* L. *J Ethnopharmacol* 71: 1–21.
- Scarborough J (2012) *Dioscorides*. In: Bagnall RS, Brodersen K, Champion CB, Erskine A, Huebner SR (eds.) *The Encyclopedia of ancient history*, Blackwell Publishing Ltd, Hoboken, New Jersey, p. 2137–2138.
- Scarborough J, Nutton V (1982) The preface of *Dioscorides' Materia medica: introduction, translation, commentary*, Transactions and Studies of the College of Physicians of Philadelphia 4: 187–227.
- Schaffner W, Häfelfinger B, Ernst B, Maršanić-Jovanović R (tr.) (1999) *Heilpflanzen-Kompendium*, Leo-commerce, Rijeka, p. 246–247.
- Schmitz R (1998) *Geschichte der Pharmazie, Band 1: von den Anfängen bis zum Ausgang des Mittelalters*, Govi-Verlag, Eschborn, p. 3–8.
- Siraisi NG (1990) *Medieval and early Renaissance medicine: an introduction to knowledge and practice*, University of Chicago Press, Chicago, p. 10–13.
- Skok P (1971) *Etymological dictionary of the Croatian or Serbian language*, JAZU, Zagreb.
- Sonnedecker G (ed.) (1976) *Kremers and Urdang's History of pharmacy, 4th ed.*, American Institute of the History of Pharmacy, Madison, p. 17–19.
- Stannard J (1966) *Dioscorides and Renaissance materia medica*. In: Florin M (ed.) *Materia medica in the XVth century. Proceedings of symposium of the International Academy of the History of Medicine held at the University of Basel, 7th September, 1964*, Pergamon Press, Oxford.
- Stannard J (1974) Medieval herbals and their development. *Clio Med* 9: 23–33.
- Staub PO, Casu L, Leonti M (2016) Back to the roots: a quantitative survey of herbal drugs in *Dioscorides' De materia medica (ex Matthioli, 1568)*. *Phytomedicine* 23: 1043–1052.
- Strohal R (1910) Folkloristic contributions from older Croatian books. I. Various records and spells. (Croatian Glagolitic monument from the 15th century). In: Boranić D (ed.) *Zbornik za narodni život i običaje južnih Slavena* 15: 120–132.
- Šugar I (2008) *Croatian plant nomenclature*, Matica hrvatska, Zagreb.
- Šulek B (1879) *Yugoslav plant nomenclature*, JAZU, Zagreb.
- Šušnić-Fliker Z (1986) Croatian books of folk recipe collections from the 17th and 18th century. *Farmaceutski Glasnik* 42: 367–383.
- Thaller L (1938) From a sorcerer and wizard to a modern physician. History of the fight against disease and death, *Minerva*, Zagreb, p. 29–39.
- Voigts LE (1979) Anglo-Saxon plant remedies and the Anglo-Saxons. *ISIS* 70: 250–268.
- Vrgoč A (1936) *Dioscorides, a great Greek physician and scholar. Priroda* 26: 317–320.
- Wellmann M (1889) *Sextius Niger, eine Quellenuntersuchung zu Dioscorides*. In: *Hermes. Zeitschrift für klassische Philologie* 24: 530–569.
- Wichtl M, Grainger Bisset N (ed.) (2001) *Herbal drugs and phytopharmaceuticals: a handbook for practice on a scientific basis*, 2nd ed., MedPharm, CRC Press, Stuttgart, p. 200–201, 505–507.
- Willfort R, Videk V (tr.) (1978) *Gesundheit durch Heilkräuter*, 2nd ed., Mladost, Zagreb, p. 331–333.
- Yarnell E, Touwaide A (2019) Accuracy of *Dioscorides' De materia medica (first century C.E.)*, regarding diuretic activity of plants. *J Altern Complement Med* 25: 107–120.