Aegyptus et Pannonia VIII.

Acta Symposii anno 2021

BUDAPEST

Aegyptus et Pannonia VIII.

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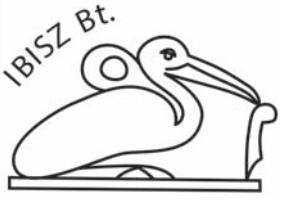

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“Plants for Health from Ancient Egypt to Present Day” Conference and the HEFS AEC

Dr. Hedvig Győry PhD
HEFT AEC president

After the realization of the 2019 mummy conference, the need arose to discuss the new trends, methodologies and achievements in ancient materia medica from a phytotherapeutic point of view and to disseminate the results achieved by our in-depth research. With this conference, we also wanted to explore how many different ways there are to approach ancient plants and medicine, also from historical, cultural, religious, ethnographic and pharmacological points of view, and to compare it with other related fields. We also wanted to draw attention to other areas of research into plants that maintain and improve health. In this way, contemporary and historical treatments were juxtaposed, Egyptian, Hittite, Greek, Roman and later European herbal medicine, to mention only the most important regions studied in these proceedings. The conference was held in two languages, English and Hungarian, but all the articles in the proceedings are English. We hope that this way we can bring these issues to the attention of as many people as possible.

This time we have chosen to discuss the plants used for health problems. A significant proportion of the substances in ancient Egyptian prescriptions are of plant origin. Reviewing and studying their effects and data can also provide new opportunities for the current pharmacopoeia. Our group of doctors thought that there was a lot of new knowledge to be gained in this area worldwide, and that the knowledge of plants is becoming increasingly important, if we only think of the research into pathogens, many of which have adapted to synthetic drugs. We need thus new materials to use to eliminate them, and earlier medical practices may lead to the discovery of new active substances that are important for people today. Knowledge of these active ingredients makes it possible to apply these drugs as new medicines in a consistent quantity and quality. On the other hand, there are also many places where conditions do not allow the use of drugs produced by modern technology, but nature can help patients with its often hidden treasures. In addition to pharmacological research, folk remedies studied by ethnomedicine

and historical medical research play an essential role in getting to know them.

The HEFS AEC partly organizes its activities in cooperation with other organizations – the above-mentioned international workshop of the Nephthys project in 2022 was co-organized by the Hungarian Natural History Museum, while this very conference took place in partnership with the HNM Semmelweis Museum of Medical History, whose members gave several lectures on historical medicine and modern ethnomedicine, and where a special chamber exhibition would have welcomed the participants in honour of the conference, if the COVID had not prevented the organization of a face-to-face meeting. Nevertheless, we were able to offer the possibility of discussions and consultations in special virtual chambers, allowing the exchange of professional experiences.

The HEFS AEC has published these new proceedings, this time in two volumes (Aegyptus et Pannonia VII-VIII), containing more than half of the papers presented at the conference: “Plants for Health from Ancient Egypt to Present Day”. As we focused on our main research topic in the Medical Research Group of the HEFC Ancient Egyptian Committee, we wondered what the scientific community thought about the ancient Egyptian use of plants in various fields of human and natural sciences, the continuity of related knowledge, and the implications and possibilities of these ancient practices for people today. We also wanted to present the ideas we had developed and the results we had achieved in the professional field, and to provide an opportunity for specialists to discuss different topics. In terms of the structure of the proceedings, we have returned to the previous method of the series, so that the articles are once again listed in alphabetical order of authors, rather than by subjects

The HEFS Ancient Egyptian Committee and the medical history

The HEFS, which has been operating since 1995, carries out several activities in the tradition of its earlier activities: the general programs focus on the last five thousand years, selecting interesting and important topics, while the work of the AEC is mainly directed in three directions. An important objective is (1) the cultural transmission and dissemination of knowledge about ancient Egyptian culture through lectures and public meetings for interested adults, also in the framework of the Hungexpo. We also organise (2) artistic and handicraft activities, workshops accompanied by discussions on various topics with children, launching every year a fine arts competition (drawing/painting), the results of which will be exhibited for the third time in January 2023 in the Deák 17 Children’s and Youth Art Gallery of the Budapest History Museum; and (3) following scientific and scholarly research into the use of ancient objects, human and animal remains – including an international event of the Nephthys Project in 2022 – and medical history, concentrated on phytotherapy and surgery.

As far as our material at the conference is concerned, we present here as a starting point our research focused primarily on the use of plants in surgery, if only because several members of the group are doctors from the Department of Surgical Research and Techniques at the Faculty of Medicine in Semmelweis University, Budapest. The first scientific results of this new direction are published of today's surgical tools and materials. Thus our conference papers focus on the ancient Egyptian surgery from the point of view of the application of plants in these volumes, but research is alsobeing carried out in other areas. Firstly we present research in the direction that is mainly focused on comparative analysis, directed towards the ancestors surgical kit, the plant materials used for wound care and the general knowledge of ancient Egyptian surgeons, with a view to the surgical culture of other peoples and periods or the use of pharmacognostic knowledge. We have also considered it essential to investigate into possible reasons for the use of plants, which may allow us to consider modern phytotherapeutic applications.

Two other areas of our phytotherapy research are also represented in these volumes. The origin and treatment of various diseases throughout the world, and especially in ancient Egypt, is also an interesting topic. In this direction, we have chosen to focus one disease in particular. Diabetes is one of the most widespread diseases of our time, and we have chosen to study its ancient treatment methods. In this case, as in the case of surgery, we have compared several cultures to find out the ancient knowledge and problem-solving methods, and have pointed out herbs that are officially used in the world, or in Hungary.

Another problem of our time, seemingly far removed from the history of medicine, is the conservation and preservation of biodiversity, which is affected not only by climate change and other natural factors, but also by human activity. This phenomenon can be traced back even to ancient Egypt, although the process has accelerated in the last hundred years. One of our topics in this respect is presented here, showing how an ancient curiosity herb has become a plant of large-scale production in the 21st century, and saving this way the species from extinction.

A new direction of the group is the study of the history of Hungarian phytotherapy in partnership with the Semmelweis Museum for Medical History. We have just taken the first steps in this direction, but we can already say that the classical Roman authors, and the ancient Egyptian knowledge they transmitted also played an important role in official medical practice and influenced folk medicine in our country. It seems that the herbaria published in Hungarian language played a key role in this process.

The interweaving of contemporary and historical issues characterizes many of the articles in the volumes. At the same time, mutual influences, shifts of emphasis and reinterpretations within the ancient world, or elements of later historical periods that reach into the past or present, play a prominent role. In this field, it is essential to collect and examine the sources from a new perspective in order to obtain a clearer picture of certain details of the past. Historical, artistic, literary, religious, economic, museological, pharmaceutical, phytotherapeutic, ethnobotanical or even chemical points of view appear in individual articles. It has been proven that the ingredients listed in many of the ancient Egyptian recipes studied so far can still be used as effective medicines today.

This volume contains 16 contributions on the role of drug use in different periods. There are chapters on the reconstruction of some ancient Egyptian remedies, on the ancient method prescribed for the preparation of antjw ointment, or on the preparation and action of kyphi, and pelargonium, traced through biochemical and experimental research; Others are devoted to the materia medica used in Hungary over the centuries, or to the comparison of contemporary Egyptian folk medicine and pharaonic materia medica in the field of gynaecology; another is devoted to studies on the possible identification of magical Egyptian plant names with a dominant connection to the moon, or to the ritual and non-ritual use of some plant substances with religious names in Egypt. Others relate to the popular treatment of diseases such as tuberculosis and cholera in Hungary, or which edible plants have been identified in Coptic medical therapies. Sedative plants are also featured in the current volume, and a plant closely associated with a butterfly is discussed. Another article focuses on the pomegranate, with its many meanings as a symbol of fertility and female power. Yet another focuses on the worldwide surgical use of plants, while others discuss the balance between practical and religious beliefs in the use of medicinal plants. The pop-up exhibition for the conference is briefly introduced, hinting at the museological aspect of medical history.

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The editors of these volumes would like to thank again all the organizations and individuals who made the conference and the publication of these volumes possible, as well as the speakers, the members of the Organizing and Scientific Committees, the secretary of the conference, and the technical assistance, i.e. all those who contributed to the realization of the conference and who have contributed with their knowledge to the these volumes. Special thanks are also due to the authors of the papers for their work and cooperation.

We would also like to express our gratitude to all those colleagues and volunteers who have shared their expertise and offered their generosity by providing scientific or linguistic proofreading for these volumes.

Thanks are also due to the active participation of Aquila Design, who coordinated and realized the editing and printing and to our financial supporters, the Hungarian Natural History Museum, the Ibisz Bt. and the Kiss Ferenc a Növényi Biodiverzitásért Alapitvány [Kiss Ferenc Plant Biodiversity Foundation], whose aim is to raise awareness of the natural treasures we have and to try to teach people to use them, rather than abuse them.

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Herbs in Wound Care from Ancient Times to the Present Day

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Abstract

People have been using medicinal plants to heal wounds since prehistoric times. Although we are living in the 21st century, there are still parts of the world where more than 80% of the population still use traditional old methods of healing, mostly with plants. The knowledge of medicinal plants dates back more than 5000 years, and written records have subsequently been preserved, varying from continent to continent. These include medicinal plants used to treat wounds from ancient times to the present day. Modern science confirms their effectiveness by isolating the active ingredients and determining their mechanism of action in the treatment of wounds. The effects of medicinal plants on wound care is, however, complex, as they contain not just one active ingredient but a whole range of them, and the interactions between the constituents are still to be fully understood.

Keywords: wound care, herbs, active ingredients

Introduction

Almost three quarters of the world's population still use traditional folk medicine and herbs to maintain their health and treat their illnesses. Before the advent of modern medicine and medical science, people on all continents had been using medicinal plants. According to the WHO, nearly 80% of people use herbal medice and more than 21,000 plant species are known.[1] In Egypt, Mesopotamia, India or China herbal drugs are attested in traditional medicine since ancient times. It is interesting to note that nearly 30% of herbal medicines are used to treat wounds and skin conditions, compared to only 1-3% of modern medicines.[2]

1 Pravee – Hitesh 2020, 1071.

2 Budovsky 2015, 171.

Herbs and herbaria
In Europe and Egypt

Ancient Egyptians used a whole range of medicinal plants. The Smith papyrus, written down between 1650 and 1550 BC, contains already detailed descriptions of various types of wounds with treating protocol. Also the contemporaneous Ebers papyrus has many prescriptions to treat different types of wounds, and there are some other papyri with recipes for trauma, treating the skin and wounds.[3] Greek and Roman travellers often went to study the Egyptian sciences, and during the Hellenistic period, the most well-known ancient medical centre worked at Alexandria, where the knowledge of the earlier and contemporaneous world was collected and developed.

The foundations of European medicine date back to Hippocrates (460-377 BC) and Aristotle (384-322 BC), whose ideas were probably based partially on ancient Egyptian and Indian knowledge. The significance of Galen of Pergamon (131-199 AD) is outstanding, as he was the first to define the health principles of medicine, and his works were the most influential for the medical history in Europe. The Greek and Roman physicians were convinced that the world was made up of four elements: earth, air, fire and water.[4] In the human body, each of these elements have their fluid counterpart. These are blood, saliva, yellow and black bile. The four elements were equated with different properties: heat, cold, moisture and dryness. These were associated with the appropriate herbs to restore balance.

Portre of Hippocrates in the Wellcome Collection (https://iiif.wellcomecollection.org/image/L0014825/full/760%2C/0/default.jpg)

This was also the conviction of Pedanios Dioscorides (40-90 AD). He was a widely recognised Greek military physician, botanist and pharmacologist, whose works are known only from later documents. The exact date of his activities is not known. His best-known work became later the lexical catalogue *Περὶ ὕλης ἰατρικῆς* (*On the healing substance*) / *De Materia Medica*, written in the 1st century AD around 60-64 AD. It contains a list of medicinal substances, mostly plants with their names, effects and uses, and in the Middle Ages, it was supplied with illustrative drawings.[5] Its unique value is that, in addition to the Greek and Latin names of plants, it also gives the vernacular names in other

3 Győry 2018, 99.

4 Forrai 2019, 40

5 Its latest translation is Osbaldeston 2000.

languages known to him including Egyptian, Punic, Syriac, Celtic and Dacian. This is particularly important for the otherwise non-literate Dacians. This work is the best-known ancient herbarium.[6] The book took its final form in the 3rd century AD, when it was turned into an alphabetical lexicon. A Latin version was produced by Apuleius (124-170 AD) under the title *De medicaminibus herbarum.*[6] It was in general use by the end of the 4th century. The detailed description of some 600 medicinal plants soon became a basic work that had a major influence on medieval European and Arabic medicine, because for about 1000 years it formed the basis for the use of medicinal plant treasures.

In 800 AD, medicinal plants were cultivated in monasteries according to strict rules. One of the famous figures of this early medieval period was Hildegard of Bingen (1098-1179).[7]

A new trend into drug use was introduced by the Swiss alchemist and surgeon, Theophrastus Bombastus von Hohenheim, named also Paracelsus (1493-1541),[8] by emphasising the importance of precise dosage in medical treatments. He travelled throughout Europe and learned his knowledge of plants from traditional herbal practitioners. He became a professor in Basel in 1526, where he described many native medicinal plants and their uses in his book *Die Grosse Wundarzney*. He coined the term *Quinta essentia*.[9] Originally this term was used in antiquity by Aristotle as a fifth element in addition to the 4 basic elements described above. Aristotle believed that this substance was eternal, that it did not disappear, decay or age, and that it was characterised by cyclicity. In the Renaissance, there were more tangible attempts to define it, although divine nature was still attributed to the fifth element. Paracelsus called by this name the extract of the herb, the "*active ingredient"*, which is the essential part of the plant. Even in modern times, for example, this term is used in chemistry – to refer to a pure, uncontaminated substance.[10]

It is important to mention two works by the German physician Leonhart Fuchs (1501-1566), *Historia Stirpium* [History of the Plants] (1542) and *New Kreuterbuch* (1543), which made medicinal plants recognisable to the common people.[11] The Flemish botanist Matthias de l'Obel (1538-1616) wrote *Kruydtboeck* (1581). He spent much of his life searching for a rational method of classifying plants that could be detected empirically. John Gerard (1545-1612), an English horticulturist, wrote *Herball* (1597), which contains

6 Staub 2016, 1044.

7 Bizzarri 2018, 114.

8 Madarász 2020, 24.

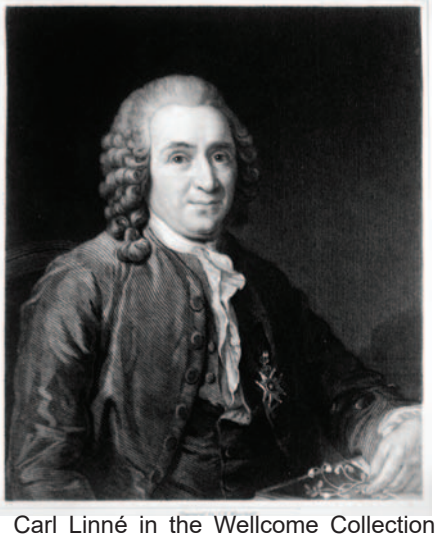
9 Aras 2022.

10 Pagel 1958, 50

11 Meyer et alii 1999, 11.

1484 illustrations for the plants.[12] Nicholas Culpeper (1616-1654), also an English pharmacist, wrote *The English Physitian* (1652), which categorised hundreds of outdoor medicinal plants.[13] The first Hungarian herbarium book was written by the bishop of the Calvinist Reformed Church of Debrecen, Péter Méliusz Juhász (1532-1572): *Herbarium a füveknek nevekről, természetekről és hasznairól* [Herbarium on the Herbs' Names, Natures and Uses].[14]

Carl Linné (1707-1778), associate professor at the University of Harderwijk in Leiden, was the creator of binomial nomenclature.[15] In Hungary, the poet Mihály Fazekas (1766-1828) applied Linne's doctrines in his book, *Magyar Füvész Könyv* [The Hungarian Herbal]. His co-author was the botanist Sámuel Diószegi.[16] The herbal was published in 1807 in Debrecen by György Csáthy. The idea of the two authors was to publish a book that would make plants recognisable to anyone. As they wanted to describe plants not only for their medicinal properties, but also for their agricultural usefulness, edibility, their role in certain crafts or simply for their beauty, they focused on plant identification. They believed that knowledge of plants should take precedence over medicine, as the latter would have required a more thorough knowledge of medicine.[17]



Carl Linné in the Wellcome Collection (https://iiif.wellcomecollection.org/image/M0000272/full/760%2C/0/default.jpg)

The medicinal plant research started in Hungary with the work of Béla Páter (1860-1938), who founded the first Botanical Research Centre in Kolozsvár (now Cluj-Napoca).[18] Béla Augustin (1877-1954) was the founder of the first Herbal Experimental Station, and is credited with the testing of medicinal plants and drugs, and the development of a control system. Still now, research is being carried out with medicinal plants besides the synthetic

12 Gerard 2015, 13.
13 Poynter 1962, 152.
14 Gazda 2020, 186.
15 Ambrose 2010, 8.
16 Lakner 2021, 211-212.
17 Tassi – Balázs 2012, 8.
18 Farkas – Lázár 2010, 5.

drug production. Currently 50% of the research is based on medicinal plants.[19] The most well-known medicinal plants are *Arnica montana* (arnica), *Atropa belladonna* (deadly nightshade), *Drimia maritima* (squill), *Foeniculum vulgare* (fennel), *Matricaria chamomilla* (chamomile), *Silybum marianum* (milk-thistle), *Urtica dioica* (nettle), *Valeriana officinalis* (valerian).[20]

Chinese herbs

Tao Hung Jing: http://en.chinaculture.org/focus/focus/2010expo_en/2010-05/21/content_380191.htm

Traditional Chinese medicine dates back more than 5000 years. The earliest written record of herbalism is *The Great Nature Herbal* by Shen Nong Ben Cao Jing (2800 BC), emperor and scholar of the Song Dynasty. It was later translated by Tao Hung Jing and became known as *Comment on the Divine Husbandman's Classic of the Materia Medica*.[21] One of the other two works that are considered very important are Wu Shi Er Bing Fang or *Prescriptions for 52 Diseases*, an ancient Chinese text discovered in 1973 in a sealed tomb in Mawangdui. The tomb was sealed in 168 BC, during the Han Dynasty. The writing dates back to 403 BC. It consists of roughly 9950 characters and is considered to be the longest known medical text found in ancient Chinese tombs.[22] Another significant work is the Shan Hai Jing or *Book of Mountains and Waters*, which dates from between 403 and 221 BC. In fact, it may not have had a single author, but was added to and written by several authors over the dynasties up to the Han dynasty. The descriptions it contained, are usually about medicines, animals and geological features.[23]

The first collection of Chinese medical and medicinal works, considered to be the oldest in China, is the *Huang Di Nei Jing collection*. Its books are the most important sources of traditional Chinese medicine to date, dating from between 100 and 200 BC. The significance of *the Yellow Emperor's Inner Books* lies in the revolutionary paradigm shift in outlook and worldview,

19 Szabó 2015, 24-25.
20 Wink – Wyk 2017, 9.
21 Wang et alii 2020, 42086-7.
22 Strassberg 2002, 19.
23 Dorofeeva–Lichtmann 2015,104.

in that they provided new, alternative explanations for the previously existing and widespread animistic and shamanistic explanations of disease in Chinese culture.[24] The books suggest that rational factors such as lifestyle, diet, weather, psychological and mental endowments, and age are in the background of diseases. It is in these works, where the forces and ordering principles that are so characteristic of the traditional Chinese worldview, such as the Tao, the yin and yang, the chi or the five elements, are also first put into a system responsible for man's biological existence and health. They offer previously unknown methods for restoring a state of equilibrium to these forces and for preventing and curing diseases.[25] The best-known classic on this subject is the work of Li Si-chen (1518-1593), a famous Chinese physician, who wrote *Pen Cao Gang Mu* or the book *Fundamentals of Pharmacy* in 1578. This monumental work of 1.9 million characters contains 1892 types of medicinal plants and more than 11,000 treatment procedures. The most comprehensive work, entitled *Modern Day Encyclopaedia of Chinese Materia Medica*, was published in 1997 and lists nearly 6000 medicines, 4800 of which are of herbal origin.[26]

The best-known herbs are *Angelica polymorph* (dang gui), *Artemisia annua* (ging hao), *Ephedra sinica* (ma huang), *Paenia lactiflora* (bai shao yao), *Panax ginseng* (ren shen), *Rheum palmatum* (da huang).[27]

Indian medicinal substances of plant origin

Today, 80% of people use Ayurvedic medicine. Its roots are said to date back to prehistoric times. Ayurveda, or the "*science of life*", is a 5000-year-old system of medicine in India, still alive and well, a legacy of the ancient culture of the Vedic civilisation of the peoples of the Indian subcontinent. Ayurveda is believed to be of divine origin from Brahma, and was passed down to the sages to provide healing, holistic knowledge to ensure well-being for people.

Sushruta from Wikimedia commons

24 Curran 2008, 777.
25 Jaiswal et alii 2015, 251.
26 Yang – Yang 2019, 32-33.
27 Wink – Wyk 2017

They formulated the properties of medicinal plants in the form of shlokas or „*beads*". Hindu medicine is based on four prominent Vedas or „*collections*" – Jajur Veda, Rig Veda, Sam Veda and Atharva Veda. The best known is the Rig Veda, which contains 1028 shkola and 68 plant descriptions.[28] Its therapies include herbal medicines, special diets, meditation, yoga, massage, laxatives, enemas and medicinal oils. The oldest description of Ayurveda is in the Sushruta Samhita, the earliest palm-leaf manuscript, preserved in the Kaiser Library in Nepal. Written by Sushruta (prob. 800 BC), one of India's most famous physicians, the surviving form consists of 184 chapters, 1140 diseases, 700 herbal remedies, 57 animal and 64 mineral preparations.[29] Likely, it had several authors over the centuries, resulting in several versions. The Drdhabala (300-500 BC) version has survived in its most complete form to the present day.

The best-known medicinal plants are *Azadiracha indica* (neem), *Centella asiatica* (gotu Kola), *Cinnamomum verum* (cinnamon), *Elettaria cardamomum* (ela or cardamom), *Rauvolfia serpentina* (Indian snakeroot), *Santalum album* (santalwood), *Terminalia species* (myrabalan), *Withania somnifera* (ashwagandha).[30]

African medicinal plants

African traditional medicine is the oldest and perhaps the most diverse of all ancient medical systems. The African biological and cultural diversity is the cradle of humanity – more than 2000 languages are spoken on the sub-Saharan continent – and as they differ from each other, so the medicine varies from area to area. Unfortunately, most of the tribes have hardly any written records to this day. It seems common though, that they take a holistic approach and use many different plants in their treatments.[31]

Some of these well-known African medicinal plants are *Agathosma betulina* (buchu), *Aloe ferox* (Cape aloes), *Aloe vera*, *Artemisia afra*, *Aspalathus linearis* (rooibos tea), *Boswellia sacra* (frankincense), *Catha edulis* (khat), *Commiphora myrrha* (myrrh), *Harpaphytum procumberns* (devil's claw), *Hibiscus sabdariffa* (hibiscus or roselle), *Hypoxis hemerocallidea*.[32]

28 Jaiswal – Williams 2016, 51.
29 Tewari – Shukla 2005, 229.
30 Wink – Wyk 2017, 10.
31 Bussmann et alii 2018, 207.
32 Wink – Wyk 2017.

Middle Eastern herbalism

A number of herbal treatment methods survive on cuneiform tablets from the Sumerian, Babylonian and Assyrian empires between 4000 and 2600 BC. The Hammurapi Code from 1700 BC – beside of pricing the medical activity – also lists a number of medicinal plants. Records of medicinal plants in the Bible date from 1500 BC. Ashurbanipal of Nineveh (668-627 BC) was one of the last great kings of Assyria, and his more than 100 cuneiform marble tablets contain descriptions of 250 medicinal plants.[33]

In the Middle Ages, Arabic-Persian herbalism was a well-established science. Its most famous exponent was Avicenna (980-1037 AD), one of the best-known physicians of the Islamic Golden Age. His five-volume *The Canon of Medicine*, or *Canon Medicinae*, was used as a textbook in the Islamic world and in Europe until the 18th century.[34]

Some famous medicinal plants: *Allium cepa* (onion), *Astracantha gummifera* (tragacanth), *Carthamus tinctorius* (safflower), *Carum carvi* (caraway), *Ferula assafoetida* (asafoetida), *Lawsonia inermis* (henna), *Papaver somniferum* (opium poppy), *Peganum hermala* (Syrian rue), *Prunus Dulcis* (sweet almond), *Punica granatum* (pomegranate), *Rosa damascena* (Damask rose), *Ricinus communis* (castor oil plant), *Salvadora persica* (toothbrush tree), *Senna alexandrina* (senna), *Sesamum orientale* (sesame), *Trachyspermum ammi* (ajowan), *Trigonella foenum-graecum* (fenugreek), *Vitis vinifera* (grape).[35]

Herbs from the Americas

Many herbal treatments were recorded by pioneers in North America, such as Samuel Thompson (1794-1868), who described the effects of *Capsicum frutescens* (cayenne) and *Lobelia inflata* (Indian tobacco).[36] John Bartham (1699-1777) was the first early Anglo-American botanist. He compared the plants of America with those of Europe. He also introduced many plants from the New World to England and Sweden. He established the first botanical garden on his farm in Philadelphia – in 1960, the area was designated a National Historic Landmark.[37] Jacob Dyckman (1788-1822), a New York physician, contributed descriptions of 50 American medicinal plants to the *Edinburgh New Dispensatory VIII*. The book was originally written by Andrew Duncan (1773-1832) and summarizes medicinal chemistry, the pathophysiology and natural herbs of the *Materia medica* used in medicine.

33 Dey et alii 2012, 27.

34 Shamsi-Baghbanan et alii 2014, 1-2; Blázovics 2016.

35 Wink – Wyk 2017.

36 Morrow 1882 (reprint 1992), 304.

37 Hobbs 1991, 183.

It also incorporated modern pharmacopoeia from Edinburgh 1805, Dublin 1807 and London 1815.[38] Benjamin Smith Barton (1766-1815) was North America's first professor of natural history, wrote the first American botanical book and established the largest botanical garden in the world.[39] Wooster Beech (1794-1859) founded the eclectic medicine, based on holistic medicine with traditional herbs. He founded a school and his favourite herbs included *Echinacea purpurea* (coneflower) and *Hydrastis canadensis* (goldenseal).

Thomas Cook
from Wikipedia

The emergence of neo-Thomasonianism marked the beginning of a new trend in the field of naturopathy and botany in North America, with prominent representatives such as Thomas Cooke (1808-1892), William H. Cook (1832-1899), Alva Curtis (1797-1881) or Albert Isaiah Coffin (1790-1866).[40] One of the great figures of the eclectic medicine was Finley Ellingwood (1852-1920), author of *American Materia Medica, Therapeutics and Pharmacognosy*, published in 1919. Written for practicing physicians and surgeons, his main emphasis is on the physical diagnosis and the effects of herbs on organs.[41]

The extremely rich flora of Central and South America contains a wide variety of medicinal plants, but unfortunately there are few records on the subject.Commonly known medicinal plants include: *Cinchona pubescens* (Peruvian bark), *Erythroxylon coca* (coca), *Handroanthus impetiginosus* (lapacho), *Ilex paraguariensis* (maté), *Myroxylon balsamum* (Tolu balsam), *Paullinia Cupana* (guarana), *Pemus boldus* (boldo), *Psidium guajava* (guava), *Spilanthes acmella* (Brazilian cress), *Uncaria tomentosa* (cat's claw).[42]

Medicinal substances from Australia

Many medicinal plants have been used there, but precise documentation of their use is lacking. The influence of Chinese medicine is strongly felt in the remedies. The best-known herbs are *Croton tiglium* (purging croton), *Duboisia hopwoodii* (pituri), *Eucalyptus globulus* (bluegem), *Melaleuca alternifolia* (tea tree), *Styrax benzoin* (benzoin), *Syzygium aromaticum* (cloves).[43]

38 Lewis et alii 1818.
39 Bell 1971, 198.
40 Berman – Flannery 2001, 57-58, 117.
41 Berman 1956, 133.
42 Wink – Wyk 2017,13.
43 Wink – Wyk 2017, 14.

Herbal treatments worldwide

For treatments, the herbs were dried, crushed, made into tinctures, steeped in oil or wine. They were ground into powder or used to make poultices or dressings, and some plant constituents were also used fresh. For example, the leaves of willow, plane, acacia or walnut tree were used for wound dressings and poultices. Tannic acid from acacia seeds was commonly used to cool blood vessels and heal burns.[44] Phytochemicals in medicinal plants include alkaloids, flavonoids, glycosides and terpenes. These compounds act at all stages of wound healing. (Figure 1.)

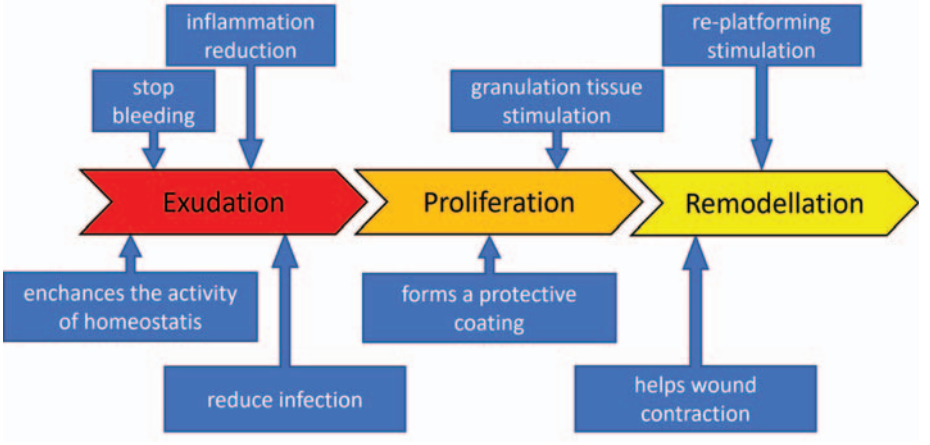


Figure 1. The process of wound healing (The writer's own material)

Wound healing process

The wound healing process is a highly dynamic, complex physiological process that starts immediately after injury. The wound healing process consists of exudation, proliferation and remodelling phases.

- In the first phase, the active ingredients of medicinal plants help to control bleeding, support the body's response to injury, reduce inflammation and infection. In the inflammatory or exudation phase, the main aim is to support the response to the injury: cleaning the wound, preventing excessive fluid loss, restoring homeostasis after the noxa.
- In the second or proliferative phase, the body focuses on wound healing. In this phase, the herbs mainly support granulation. At this stage, the wound bed is enlarged, vascularization and a high level of fibroblast activation are

44 Aboelsoud 2010, 87.

observed. It is important to provide an adequate protective layer against both dehydration and infection.
- In the third, remodelling phase, the wound closes and exfoliates. The most important task is the migration of epithelial cells. Herbs support reepithelialisation and help the wound to contract.

As herbs contain a wide range of active ingredients and their composition is not yet fully known, it is not possible to say which herbs can be used exclusively in which wound healing phase. It is important to note, however, that the herbal medical formulations used in wound care are based on evidences, guidelines and a large body of research. Below discussed you will find plants that are the most widely used ones in everyday medical practice for wound treatment in Hungary, as their active ingredients have already been approved by science.

Aloe vera or Aloe succotrina (Figure 2.)

is perhaps one of the best-known medicinal plants to date. Its range of uses in the beauty industry is so wide that it is impossible to list. It has been used for wounds for nearly 5000 years by the natives of Africa and Asia.[45] Its most active identified ingredients are acetylated mannan, polymannan, anthraquinone C-glycoside, antrone, anthraquinone and lectin. Several of them have strong antimicrobial activity, especially against Gram-positive bacteria. It stimulates macrophage and T-cell activity, induces proinflammatory cytokines, thereby stimulating wound healing and shortening wound closure. It promotes the proliferation and migration of fibroblasts and keratinocytes.[46]

Figure 2. Aloe vera in Köhler 1887, vol II. pl. 148

Nearly 300 *Aloe* species are known, of which 5 have been shown to have curative activity. The most effective of these is *Aloe Barbadensis* Miller, only the leaves of which are used for medicinal purposes. It has been used for burns, superficial wounds, skin irritations, sunburn and eczema.[47] Queen Cleopatra VII (69-30 BC) is said to have used it regularly. Greek physicians in the 4th century BC imported the

45 Ahmed – Hussain 2013, 29.
46 Uma et alii 2011, 91.
47 Shedoeva 2019, 2-4.

plant from the island of Socotra. It is said that Alexander the Great's mentor Aristotle in 333 BC suggested the island to be conquered for the preparation of *Aloe vera*, which he considered necessary mainly for the treatment of injured soldiers.[48] Written records of its cultivation and use date back to the 4th century BC. One of the earliest records of the use of *Aloe vera* as a medicine is found in the *Materia Medica* (III.25) by Pedanius Dioscorides (40-90 AD).[49] According to him, *Aloe vera* gel consists of 98.5-99.5% water, with the remaining solids consisting of 200 components, most of which are polysaccharides.[50] Today *Aloe vera* is available in liquid, gel, cream, spay and knitted (wet wipe) forms.

***Calendula officinalis* / marigold flower (Figure 3.)**

is also one of the most versatile herbs.[51] It was traditionally used locally to treat ulcerating skin conditions and bruises, as well as stomach upsets and menstrual cramps. It also has antiseptic, mild antiperspirant and antispasmodic properties.[52] In early folk medicine, since the 12th century, marigold flower extracts were commonly used, for example, as external anti-inflammatory agents against pus.[53] It was invoked to speed healing during the American Civil War. It was used both internally and externally, and even for cooking. It is known for its anti-inflammatory, exfoliating and antibacterial effects. The inflorescences are used to make wound ointments all over the world to treat ulcers and various skin conditions.[54]

Figure 3. Marygold in Köhler 1887, vol III. pl. 61.

Calendula officinalis inflorescences are rich in terpenoids, coumarins and flavonoids. The following terpenoids have been identified in the inflorescence and they are responsible for the following anti-inflammatory and anti-edematous effects of calendula: Sitosterols, stigmasterols, diol diesters, taraxasterol monoesters, erythrodiol, brien, ursadiol, faradiol esters, arnidiol esters, calenduladiol esters,

48 Lamel 2015, 100.
49 Manyitha 2014, 86.
50 Ahmed – Hussain 2013, 30.
51 Quave 2018, 290.
52 Yetis – Arslanoglu 2017, 835
53 Mohammed – Kashani 2012, 1469.
54 Givol et alii 2019, 549.

oleanolic acid saponins, calendulosides, calendulaglucosides, glucuronides, calenduladiol, faradiol, lupeol and cornulacic acid. The following flavonoids have been identified in the inflorescence as being responsible for some of the antimicrobial properties: quercetin, isorhamnetin, zoquercetin, narcissin, calendoflaside, calendoflavoside, calendoflavobioside, rutin, isoquercetirin, neoheperidozides, and the rutinosides isohamnetin and quercetin.[55] The essential oils of the inflorescence are monoterpenes and sesquiterpenes: α-tujene, α-pinene, limonene, 1,8-cineole, geraniol, α-cadinene and α-cadinol. The carotenoids responsible for the yellow-orange colour of petals and some anti-inflammatory effects include neoxanthin, violaxanthin and luteoxanthin, auroxanthin, favoxanthin, lutein, cryptoxanthin, lycopene, α-carotene and β-carotene.[56]

The European Medicines Agency (EMA) has approved the aqueous alcoholic and lipophilic extract of *C. officinalis* as a traditional medicine.[57] It is currently available in cream, foam, ointment and balm forms.

Hypericum perforatum / St. John's wort (Figure 4.)

is native to Europe and Asia, and is an invasive species in Oceania and North America.[58] It has been used to treat burns, wounds and various inflammatory skin conditions. The dried inflorescence is soaked in vegetable oil (most commonly olive oil) and left in the sun in a transparent container in the open air for 40 days, during which time it takes on a deep red hue. This preparation "*Oleum hyperici*" is used topically to treat burns, chronic wounds and ulcers in the Balkans and Anatolia.[59] It has also been used in traditional medicine for sunburn, muscle pain, bruises.

Figure 4. St. John's wort in Lindman 1907, pl. 230.

Hypericum perforatum is rich in proantho-cyanidins (catechin, epicatechin, leucocyanidin), flavonoids (hyperoside, rutin, quercitrin, isocercitrin, quercetin and kaempferol), biflavonoids, tannins, floroglucinol derivatives (hyperforin), phenolic acids, essential oils, sterols, naphthadi-

55 Maver 2015, 743.
56 Quave 2018, 290.
57 Quave 2018,291.
58 Barnes et alii 2001, 583.
59 Quave 2018, 291.

antrons (hypericin and pseudohipericin), vitamins C and A, and xanthones.[60] The most important bioactive compounds include hypericin, pseudohipericin and hyperforin. Its aqueous extract has classic anti-bacterial activity, inhibiting bacterial growth, while the oily version inhibits biofilm formation.

It has been used to treat wounds since the Middle Ages. Paracelsus (1493-1541), the well-known Swiss chemist and physician was the first to write about it, believing that the herb had a divine sign.[61] It has been used both internally and externally, but large amounts of it can sensitise the skin, causing itching and inflammation. It is currently available in oil drops, solution and ointment.

Matricaria camomilla / Chamomile or Medicinal Chickweed (Figure 5) is native to the eastern Mediterranean basin, and is widespread throughout the temperate world. It is used both externally and internally for its anti-inflammatory properties. It is also used as a poultice in the treatment of wounds. Its flowers are used to make tea, distillate and essential oils.

Figure 5. Camomile in Köhler 1887, Vol II. pl. 64.

The active constituent of its inflorescence is an essential oil, which is greyish blue in colour from the chamazulene formed during distillation. Most of the constituents of chamomile oil are sesquiterpenes (bisaboloids, bisabolol oxides). It also contains polyacetylene derivatives (e.g. en-yn-dicycloether). Nonvolatile active substances are flavonoids, their glycosides, coumarins, pectin-like mucilages.[62]

The Roman author, naturalist and philosopher, Gaius Plinius Secundus (23-79 AD) described three species of chamomile. In his time incense and drinks were made from chamomile. Hippocrates (460-377 BC), the ancient Greek physician, believed that the herb relieved menstrual cramps and was useful for treating haemophilia. In the Middle Ages, the Anglo-Saxons considered chamomile to be one of the nine sacred herbs. Monks experimented with the plant to

60 Muley et alii 2019, 457.
61 Dugoua et alii 2006, 269.
62 Crockett 2011, 429-430.

learn about its healing properties, and monastic orders cultivated it regularly.[63] Essential oils were produced by distilling the plant. Currently available in ointment, cream, oil and dried form.

***Arctium lappa* / Greater borage (Figure 6.)**

is native mainly to North America, Europe and Asia, but is now widespread throughout the world.[64] It is used to treat burns, skin rashes and boils. Dioscorides (IV,107: *arcion*) mentions that „*it soothes sores from wrenching the joints around*" when the root-decoction is smeared on, and „*the leaves are effective applied to old ulcers*", while its smaller variety (IV, 106: *arctium*) "*is a poultice for burns and chilblains*".

Figure 6. Greater borage in Thomé 1885, pl. 592.

Presently it is used to treat burns, skin rashes and boils. It is a proven antioxidant, anti-inflammatory and antimicrobial plant. The extract of the root has been shown to stimulate extracellular matrix function, affect the turnover of glucosaminoglycans and reduce wrinkles on the skin. Dried root and its oily or alcoholic extracts are used.[65] The root contains inulin, mucilages, trace essential oils, sesquiterpene lactone bitter, polyols, caffeic acid derivatives, triterpenes.

In the Middle Ages, Hildegard von Bingen (1098-1179) treated tumour patients with the root of the plant.[66] Later it was used to treat wounds, especially purulent, exudative wounds and skin rashes. Nowadays, it is used as a tea for internal consumption or externally as a poultice, and the root is used in powdered form. Its oily extract is used as a base for cosmetics, shampoos and hair care products.

***Plantago lanceolata* / Lanceolate plantain or narrow-leaved plantain (Figure 7.)**

It is native to all of Europe and is found almost all over the world. During Roman times plantain was recommended for the treatment of various ulcers, ulcerations, tumours, cuts, bites, inflammations and burns, as attested by Dioscorides (II,153: *Arnoglosson*)

Its main active ingredient is glycoside aukubin, but it also contains

63 Singh 2011, 82-83.
64 Srivastava et alii 2011, 1-2.
65 Tobyn 2011, 92-93.
66 Bizzarri 2018.

polyphenols, mucilage polysaccharides, vitamin C, tanning agents, silicic acid, potassium, zinc. It is bactericidal and anti-inflammatory.[67] Its crushed leaves are effective for insect bites and minor burns. Externally it can be used for skin wounds, cuts and festering sores, hard-to-heal ulcers and to stop bleeding. The fresh leaves of plantain are commonly applied to wounds that are difficult to heal: they disinfect, constrict, close the wound and promote blood clotting.[68]

It became widely known in the 20th century, although it had long been used in Asia, China and the Mediterranean. It is also cultivated in India. According to 11th century records, it is one of the ancient sacred plants of the Anglo-Saxons. Today it is available in syrup, dried and powdered form, and in solutions.

Figure 7. narrow-leaved plantain in Curtis 1777, Vol II. pl.10.

Conclusion

Ancient and medieval observations were accurate as to the uses of medicinal plants, although the exact molecular composition of their active ingredients was not yet known, only their effects. They were prominent in the treatment of wounds.

In the future, more and more plants may prove their place in wound care. Accurate mapping and isolation of active substances could create opportunities for medicinal plants to play an increasingly important role in modern medicine for wound management, especially as antibiotic resistance has been a growing problem for decades. However, it is important to identify the exact active ingredients they contain, as this is the only way to know for which wounds, at which stage, when and in which amount to apply the herb, or even extracting these active ingredients and using them in standardised forms when even the exact dosage can easily be stipulated.

67 Kováč et alii 2014, 118.
68 Jarić et alii 2018, 312-313.

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