

Aegyptus et Pannonia VII.



Acta Symposií anno 2021

BUDAPEST

Aegyptus et Pannonia VII.

Acta Symposii anno 2021

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Plants and Health Conference 2021, and the Proceedings

Dr. Hedvig Győry PhD

HEFT AEC president

In 2021, the HEFS Ancient Egyptian Committee, in partnership with the HNM Semmelweis Museum of Medical History, organised an international conference entitled “*Plants and Health from Ancient Egypt to the Present Day*”. The three-day conference focused on topics related to the application of plant material in medicine, but also included other topics connected to the use of plants in any practical or theoretical area of human life. We planned four sections with the following keywords:

History of healing and nutrition from the time of ancient Egypt to the present day

Which plants were used for healing, how, where, by whom and when, which plants were used to maintain health, or prevent disease in different parts of the world; what did people eat in everyday life, what were the festive foods/drinks, what were the expected results; and what are the related issues raised by ethnographic research.

Medicines and pharmaceutical science in historical periods in the light of sources

Who, how and why recorded knowledge of medicine in each period; what principles were used to treat patients or maintain health; what were/are the popular explanations of these issues or principles.

Herbal medicine and contemporary medicine

According to our current knowledge, what can we assess about the active ingredients of a given plant, the mechanism of action and its intensity, and what biochemical relationships can be discerned from their interactions.

Religious views and beliefs about plants

By whom, where, when, and what special magical properties have been attributed to plants, what is the role of plants in the social context, how is it explained, and how have plants been incorporated into everyday life/celebrations or healing practices

The conference was held between 14 and 16 October 2021 with 40 presentations. Due to the COVID pandemic, circumstances did not allow for a face-to-face meeting, so the event was entirely online. However, the possibilities offered by the Internet also allowed for smaller group discussions. The topics presented included the appearance and use of plants in different times and places, from ancient Egypt to contemporary Europe. They were divided into thematic and language (English and Hungarian) sessions, led by recognised scholars. After the lectures, it was possible to discuss the issues raised in front of the general public, and topics of narrower interest could be further discussed in separate rooms created within the Zoom system. Valuable contacts were made and new research ideas were generated. A small exhibition was also organised by the HNM Semmelweis Museum of Medical History for the occasion, as we had hoped until the last minute that the pandemic situation would change. However, it was only available to personal visitors.



During the conference it was possible to learn about new methods, we exchanged ideas and heard about research results and ongoing projects. A significant part of the presentations were given in English, the other part in Hungarian, but the papers included in the proceedings are all in English. The first part of the proceedings, as a result of the presentations and discussions, is published in this volume; the other part can be read in the next volume of the Aegyptus et Pannonia series.

Although not all the presentations are published, most of the aspects we covered are included in the volumes. The programme covered a wider range of topics: We were able to learn about plant finds from recent Egyptian archaeological excavations, the identification and use of plants in textual sources, religious connotations, and even the possibility of reconstructing perfumes. We could also look at the trade in plants between the Hittite Empire and Egypt, and learn which plants were used by the Copts in the Middle Ages. The latest research on Roman herbaria was discussed, and hitherto unknown ancient Egyptian texts were presented. Other presentations were devoted to the reproduction of some medicines based on ancient recipes. In one of the lectures we saw on video the process of preparation and examination of an ancient Egyptian medicine. Several papers dealt with temporal and spatial changes in the everyday and liturgical use and interpretation of a given plant, e.g. pomegranate in Greece. In India, Soma. In Hungary, thorn apple. In Estonia, pelargonium. In Finland and the Arctic, roseroot. And in the Arabian desert of Egypt, the apple of Sodom. The role of plants in religious ceremonies and concepts was also discussed, as well as the variety and significance of the scent they produce.

The lectures presented a wide range of the application of herbs in ancient and medieval medical methodology, with the help of Egyptian, Greek, Anatolian, and Hungarian herbariums. The conference participants were the first to hear that many ancient Egyptian medicines can still be found in the medieval Welsh medicinal knowledge. We also learned that a significant part of Dioscorides' usage of herbs could also be observed in Anatolian folk medicine. Lectures were given on the wide range of magical effects attributed to plants, spanning from antiquity to the Renaissance, in terms of iatromagic, iatromathematics, and iatromythology.

In separate sections, the participants were introduced to Hungarian ethnobotanical research, where, in addition to the methods of the way of collecting ethnobotanical data throughout Transylvania, the lecturers presented both the botanical aspects and the therapeutic potential of the plants included in the various Hungarian medicinal herbariums and pharmacopeias. In addition to the knowledge of plants preserved in the Hungarian witch-trial documents of the 15th to 19th centuries, the possibilities of historical and folk use against various diseases – such as tuberculosis and cholera – were also presented, and in connection with diabetes and surgery we also visited India and China. We got again an idea of how wound care has changed over the centuries, how plants have influenced the toolkit of surgeons, and which plants are still used in modern wound management. In connection with the Székesfehérvár Pharmacy Museum, an overview of the museum's extensive educational activities was presented in addition to its history. We have got acquainted also with the the most important medical tariff book of Hungary in the 18th century and the drawer labels of five apothecary furniture of the same period.

The approach to the flora of ancient Egypt is also diverse, and the study of the Ancient Near Eastern relations encompasses several scientific fields, such as Assyriology, Hittiteology and Biblical studies. The classical Greco-Roman world is also included in the next volume to facilitate comparison. In addition to history, interdisciplinarity also extends to other branches of the humanities, such as – among others – archaeology, history, linguistics, ethnography, philology, the history of religion and magic or iatromathematics.

In recent decades, the development of the sciences has moved in the direction of interdisciplinary cooperation, not only between related sciences, but also between seemingly distant branches of science. In addition to textual and material sources, the results and methods of the natural sciences are of fundamental importance for a more precise understanding of the past. The role of analyses and investigation of the various materials is thus becoming increasingly important, complementing traditional descriptive studies. As we also wanted to play a role in this process, several areas of natural science, such as archaeobotany, phylogenetics, types of data investigation and plant breeding, or various facets of medicine and medical history are also represented in the proceedings.

In this volume, we publish 11 studies that approach the world of plants from different perspectives within the broad framework of the conference. The focus is on ancient Egypt, but the articles also look at other areas. In addition to the data found in the articles and the results obtained, the methodological and theoretical approaches raise many new ideas, give exciting results and draw attention to various possibilities. For example, the multifaceted role of medicinal plants in the museum world or their application from the perspective of medical history and ethnomedicine.

With this volume, we hope to arouse interest in the unique world of the past, especially Egypt, to bring closer the world of nature and its possible effects on human life, and to encourage the birth of further results that will make the ancient Egyptian world better known and our own world better understood.

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CULTURAL-HISTORICAL ASPECTS OF DIABETES AND PHYTOTHERAPY

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ABSTRACT

Both types 1 and 2 of *diabetes mellitus* have probably been making people's lives miserable for thousands of years, so we would expect that their treatment would be traceable over the course of several thousand years. In this article, we examine the question of the recognition, medical definition and vegetal treatment of diabetes in the ancient Mediterranean, Middle- and Far-Eastern regions based on the ancient Egyptian papyri, the works of Graeco-Roman authors, the medical texts of Indian Ayurveda and Chinese Materia Medica, respectively, and in the field of Arabic-language medieval medicine, which partially summarized the earlier achievements, and adapted them to the Middle East. Diabetes became a defined condition in European medicine, thanks to Avicenna's *Kanun fi Tib* encyclopedia.

Medicine in these areas was strongly intertwined with the science of nutrition, so it is no surprise that dietetics became one of the main pillars of treatment in medical practice. We have isolated those cases that indicate the alleviation of the symptoms and complications of diabetes, since it was considered an incurable disease in all areas of the ancient world. Modern medicine also drew a great deal from these teachings, and advice on the right way of life, including food, is still a guiding principle. Medicinal and food plants found in ancient recipes are still often used in the treatment of diabetes today. We also provide a brief overview of 24 plants with antidiabetic effects attested by phytotherapy.

KEYWORDS: polyuria, Ebers papyrus, Galenos, Aretaeus, Charaka, Suśhruta, Chinese Materia Medica, Avicenna

1. INTRODUCTION

The sages of both ancient Mediterranean, Middle and Far Eastern cultures recognized early on the importance of maintaining health, combating

disease, the quality and extent of nutrition, and the importance of exercise. These issues are crucial even today when the prevalence of genetically inherited type 1 and acquired type 2 *diabetes mellitus* have significantly increased worldwide.¹ In an article published in 2011 the number of patients with diabetes mellitus worldwide was 30 million in 1985, 135 million in 1995, and 300 million is estimated in 2025 by the WHO. Thus, diabetes has reached epidemic proportions.² WHO also drew attention to the fact that the prevalence increases also in developing countries, where appropriate Western treatment is often not available.³

Both types of diabetes are likely to have been affecting people's lives adversely for millennia because ancient Egyptian papyri, Greek medical books, Indian Ayurveda, Chinese Materia Medica, and Arabic writings such as the *Kanun fi Tib* of Avicenna⁴ contain writings that alleviate the symptoms and complications of diabetes.

Modern medicine has also drawn much from these teachings. Medicinal and food plants found in ancient prescriptions are still nowadays used in the treatment of diabetes, and it is these of which we would like to give a brief overview.

1.2. SYMPTOMS OF DIABETES MELLITUS AND ITS TREATMENTS WITH DRUGS

Modern medicine has found that the main symptoms of *diabetes mellitus* are polyuria, glycosuria, fatigue, polydipsia and polyphagia. Characteristic accompanying symptoms of this disease are hyperventilation (Kussmaul breathing), breath that smells like acetone, nausea, vomiting, abdominal pain, lethargy, stupor, blurred vision, itchiness, slow-healing wounds and weight loss. Serious complications are blindness, kidney failure, gangrene, neuropathy, heart attacks and strokes. Hypertension, hyperlipidemia, hyperinsulinemia, and atherosclerosis are also often associated with diabetes.⁵ Without the regulating effect of insulin, the level of blood glucose fluctuates, provoking severe metabolic derangements, which leads to kidney failure, and in the end to death.

For centuries it was diagnosed by polyurination. This is also the reason, why the Greek physicians named it diabetes (“*syphon*” from διαβαίνειν “*go across*”), based on the observation that the body of such patients is

1 For risk factors see e.g. AYNALEM – ZELEKE 2018.

2 PANDEY ET ALII 2011.

3 KING ET ALII 1998.

4 SAYILI 1939

5 For further details see e.g. American Diabetes Association (2011). Diagnosis classification of Diabetes mellitus. *Diabetes Care* 34 (Suppl 1), 2011, S62-S67.

siphoned out via urine. The disease is “*a melting down of the flesh and limbs into urine*” as Aretaeus (2nd c. AD) explained. Similar knowledge is mirrored in the old Chinese name: “*wasting-thirst*” (*xiao-ke*),⁶ or in the old-Hungian *húgyár* (“*urinary flood*”).⁷ The Ayurveda labels it *madhumeha*, which is the Sanskrit expression of “*honey urine*”.⁸ In Europe it was only in 1674 that the Oxford University physician Thomas Willis (1621-1675) realised that the sweetness of urine is connected to this disease (*Pharmaceutice rationalise*), thus he labeled it (*diabetes*) *mellitus*, ie. “*honeyed/sweetened*”. Next physiologist Oskar Minkowski (1858-1931) discovered that the pancreas was the organ responsible for regulating the level of sugar in the blood (1889), while its agent, insulin was only recognized by the Canadian physician Frederick Banting (1891-1941) and his assistant Charles Best, who developed it into a drug by 1922. In St. Louis, Washington University, the Hungarian-American Michael Somogyi (1883-1971) developed further applications of insulin in his biochemical lab with the help of his dog, Champ. Mass production started soon after with pig and cow insulin, while the use of technology improved research and allowed the discovery of a great number of details concerning the illness and its types, its physiology, treatment and other aspects; but even so there are still many aspects of the disease and its treatment to discover and clarify.⁹

2. ANCIENT MEDICINE AND MODERN PHYTOTHERAPY IN *DIABETES MELLITUS*

In recent decades, there has been a growing interest in the medical knowledge of ancient cultures, not only among historians and medical historians but also among modern pharmacological researchers, as these systems have preserved methods used for thousands of years and have empirically developed practices with proven results. Modern pharmacological research is increasingly turning to plants that have already been tried and tested in traditional medicine, researching their active ingredients and using them to enable new protective agents and treatments that are more effective and more efficient therapeutic options. Plants with a positive effect on diabetes have been collected from ancient Egyptian and Graeco-Roman medical sources, from Ayurvedic and traditional Chinese medicine (TCM), and from medieval Arabic-Persian medicine, all of which go back to ancient roots. In this article, we are investigating plant-derived solutions.

6 LIU 2009; ZHANG ET ALII 2010.

7 Until the 19th century, it was said of people who drank and urinated abnormally much; independenty of the quality of the urine. Later this was the name for *diabetes insipidus*, while the *diabetes mellitus* became *sweet urinary flood*.

8 MANGAL ET ALII 2010.

9 For further details of the discovery see e.g. FELKAI 2014.

2.1. ANCIENT EGYPTIAN POLYURIA AND POLYDIPSIA

Diabetes does not leave direct traces on the bones or on the skin, so its anthropological identification is difficult or impossible. Therefore, the study of ancient disease patterns or paleoepidemiology from these sources is not available.¹⁰ On the other hand, the surviving papyri testify to a high level of medical knowledge, and ancient Egyptian medicine was much appreciated during Antiquity.¹¹ The remedies were composed for the most part of plants, which provide a base for comparison with other cultures.

Contrary, however, to expectation, little specific data can be found in these sources, which can be linked to diabetes. Written sources classify the diseases by symptoms. And indeed, there are prescriptions, which might treat the leading symptom connected to diabetes, the abnormally abundant urination. Polyuria, however, the most conspicuous symptom of diabetes can also be the result of primary polydipsia, kidney disorder, obstruction in the urinary track, lack of ADH (antidiuretic hormone) production in the brain, various hormonal disorders, less often fast/abnormal heart rhythm, migraine, cold and some other causes.

Another, very conspicuous symptom of diabetes, mentioned by ancient Egyptians is polydipsia. We can find three prescriptions, where children suffering from it are treated (Ram III A9, Ram B14-17 and Ram B19, but only the title remained, or the prescriptions are missing, apart from the magical spell), one where a thirsty bird is kept away (Eb848), two cases, which are – because of the fragmentary state of the papyrus – unclear (Kah14, ChB XV,5), and one case where its elimination is mentioned as a secondary result (Eb197). They might hint at diabetes, but *extreme* thirst is not mentioned anywhere. Even thirst can be, again, secondary, caused by various diseases, among others polyuria. Thus its independent mention does not automatically establish a clear diabetic case.

In any case, based on the thirst symptom, the above mentioned §197 (col. 39, lines 7-12) in Ebers papyrus is often cited as a prescription dealing specifically with diabetes. It is far from being a clear case, however, but very problematic. No polyuria is mentioned there, and it describes a condition where the “*mouth of the heart*” (*r3-jb*),¹² is suffering (*mr*); the patient’s body is wrinkled completely different than the usual way (*jw h^cw=f hm33=f šm3y^w r dr=f*); his body/bust/belly does not have the possibly infectious *h3y.t*-liver-

10 AUFDERHEIDE – RODRÍGUEZ-MARTÍN 1998, 343.

11 GYŐRY 2003.

12 The translation is uncertain, it is a region in the rib cage connected to the heart or the stomach, see WALKER 1996.

disease (*n gm.n=k ḥḫy.t m ḥ.t*),¹³ but it is only on the protrusion(?)¹⁴ of the flesh in the shape of a wrinkle (*wpw ḥr ḥmw.t n.t ḥꜥw, mj py.t*). All these symptoms are diagnosed to be part of the disease called by the ancient Egyptians as “unevenness / wildness or awfulness of his heart-organ” (*nḥḫ.t jb=f*).¹⁵ The thirst is just mentioned as a side effect at the end: together with the heart problem, it is a vanishing phenomenon (*ḥtm jb[.t]=f*), due to the treatment, when hematite powder, probably flaxseed (*dšr*),¹⁶ carob pod (*dšr.t*), oil/fat and honey are consumed.

The diagnosis is not enough to determine even approximately what this disease was. Ancient Egyptians linked it to some kind of excitement in the heart and its surroundings and observed an unusual skin alteration. Given that *diabetes mellitus* has many complications, including heart, cardiovascular and skin alterations, however, the possibility of such a case cannot be ruled out a priori. In case of *diabetes mellitus* complication, the iron of hematite would damage the pancreas, but the linseed might lower cholesterol levels and improve blood sugar; the carob can improve blood sugar, but oil/fat with its triglycerides can be harmful for the cardiovascular system, and the effect of honey is also ambiguous, as although honey increases blood sugar content, its anti-inflammatory and antioxidant qualities might be beneficial (see later). All in all, this prescription would not be enough to eliminate polydipsia and polyuria, the two symptoms which might be connected to *diabetes mellitus* in the ancient Egyptian medical vocabulary. Moreover, the ancient physician was certain of his success; thus, he found this disease a temporary state, not a deadly disease, which diabetes would have been at that time.

Concerning urine, there are several types of disorders treated. The “many fluid” (*mwyṯ ḥḫ*), as big quantity, might mean polyuria. Its treatment in ancient Egyptian terms could aim to “correct the plenty of urine” (*ḥk3 mwyṯ nt ḥw*, Eb264) or to “eliminate the much urine” (*dr mwyṯ ḥḫ*, Eb274-275, Eb277=H63, Eb278-280). The word ḥḫ “much, many” meant, however, not only plentiful, but also often, thus – according to Lynn D. Loriaux – this term could relate to *cystitis* rather than diabetes.¹⁷ Besides the increased amount thus, the increased

13 For the identification of the *ḥḫy.t* disease see GYÖRY ET ALII 2020, 156-161.

14 The *ḥmw.t* can be translated as “jar / box / horn / dam” depending on the classifier, but here it has the flesh determinative, thus it means a bodily part. I assume it looks similar to the issues it normally means, so it is some kind of protrusion.

15 As the verb *nḥḫ* means „to be uneven, raw, fierce, dangerous, sick”, this virtue is attributed to the state of the heart at this case, surely something oppressing, scary. It might thus mean strong or uneven palpitation, or even the contrary, and the feeling is unusual, or e.g. having visions.

16 For this interpretation see FEHÉR in this volume.

17 LORIAUX 2006, 55.

frequency of micturition might also be referred to.¹⁸ Furthermore, we do not know about the relation to the amount of fluid consumed, which is also an important fact in diabetes. We can also compare the plants used: In probable cases with many or plenty of urine, *gĵw* / *Cyperus (rotundus?)*, *swt*-wheat, *prt-šnj* / probably Lebanese pine tree nut, *bḥḥ* / ?, *jšd* / *Balanites aegyptiaca* (?), *kmyt* / resin (probably from *Acacia nilotica*), *k3dt* / ivy, *j3rrt* / grapes, *pr.t-wʿn* / juniper berry, and also honey was used.

The connection is even less sure in the case, where the physician “controlled the urine” (*sm3ʿ mwyt*, Eb27, Eb262, Eb263, Eb266, Eb269-Eb272, Eb 272bis (at infant) = Ram. IIIA.30-31, Eb283, H62), which might hint at other disorders, too. The use of plants was even more diverse: *s3-wr*-resin,¹⁹ *nbt* / arundo, *bnrj* / date, *ḥ3syt* / probably bryony, *pr.t wʿn* / juniper berry, *š3š3* / maybe catnip, *wʿḥ* / tigernut, *ḥt-ds* / ?, *swt* / probably Arab rush, *jwryt* / broad bean? or mineral?, *šspt* / cucumber or melon, *nbs* / Christ’s thorn, *sntr* / frankincense, *gĵw* / *Cyperus (rotundus?)*, *k3k3* / ?,²⁰ *nht* / sycamore, *nḥḥ* / olive oil, *k3d.t* / ivy.

Looking at the prescriptions with “much urine”, some could actually be used as a modification tool to put the sugar metabolism in order. There are always several drugs mixed into a remedy. In case of increased urination in Eb264 (49,4-6) for example a *Cyperus* species (*gĵw*, prob. *Cyperus rotundus*) is used together with Lebanese pine tree nut(?) (*pr.t-šnj*) and the unidentified *bḥḥ*-root, taking their active agents out by sweet beer (*ḥnk.t ndm.t*), which was usually made with date.



Eb 264 (49,4-6)²¹

K.t n.t k3 mwyt n.t ḥw: gĵw 1, pr.t-šnj 1, mny.t n.t bḥḥ 1,
ḥbk m ḥ.t wʿ.t, sdr ḥr ḥnk.t ndm.t,
swj, jw mhrw r=s.

18 NUNN 1996.

19 Unidentified, but based on the name „great protection”, a very efficient drug.

20 See the article of PETROVICS ET ALII in the next volume.

21 The hieroglyphic transcriptions are taken from GRAPOW 1958, as also all the next ones.

Another for the correction of excess urine: *Cyperus rotundus*(?) 1, Lebanese pine tree nut(?) powder 1, *bhh*-plant-root 1; crush into one mass, leave to stand in sweet beer, drink it while the sediment is in it.

In another case (Eb277 (50,6-8)), honey is used with *Acacia* resin and cereals. „In recent times, the use of honey has experienced a renewed interest in the context of diabetes treatment because of the rise in the accessibility of evidence-based pharmacological and clinical findings, signifying its health benefits.”²²



Eb 277 (50,6-8) (parallel: H 63 (4,14-15))

K.t n.t dr mwy.t ⁵³*w=s*:

kmj.t 1 /4, *bj n sw.t* 1 /4, *3h w3d* 1 /4, *stj* 1/32, *mw*, *bj.t* 15, *sdr*, ⁵*th*, *swj/wnm* r *hrw* 4.

Another for the elimination of urine, when it is much: *gumi arabicum* 1/4, *semolina* 1/4, *fresh porridge* 1/4, *ocher* 1/32, *water and honey* 15, leave to stand, pass through, and consume for 4 days.

It seems thus, that ancient Egyptians might have observed only milder cases of *diabetes mellitus*, which might be incorporated into the abundant urination cases, which could, however, be also *diabetes insipidus*, or any other illness, as no unusual character (consistency, smell, taste, relation to consuming) was observed and noted concerning it. Based on philological investigations, thus diabetes as a disease seems to be unknown to the ancient Egyptians. As they had no special name for this disease, it suggests that mature diabetes was unknown or very rare, at least in its clear form, thus the physicians could not have enough cases to make precise observations to tell

22 SHARMA ET ALII 2020.

it from other illnesses, thus the correlation among the symptoms could not be noticed. It is likely that diabetes 1 caused death undiagnosed at young ages – insulin deficiency without adequate supplements leads to dehydration and starvation of the body, and child mortality was high at that time.²³ Against the slow evolution of type 2 diabetes, the regular Mediterranean eating habits with its low carbohydrate content, and the herbs common in everyday life may have provided some protection. Moreover, its ultimate form had barely any time to develop due to relatively early death (average age 30-36 years).

In the light of this knowledge, if we return to the paleopathological investigations, we can find a few probable diabetes cases. Although rarely, thanks to thorough and meticulous anthropological investigations, even human remains can attest the presence of various types of diabetes in ancient times. Pathological observations make it probable at Middle Kingdom (2050–1911 BC) Deir el Bersha, where the bones of a 40-45 years old man gave this diagnosis as corroborative evidence (tomb 10O22/1B Feature 277). As the authors formulated: „*Diabetes mellitus* is a disease primarily affecting soft tissue structures. Skeletal changes can appear in individuals who are chronic sufferers of diabetes mellitus, but these symptoms are secondary to the disease. There are no pathological skeletal characteristics exclusive to diabetes mellitus; therefore, a diagnosis of diabetes mellitus from skeletal remains is very difficult.

The skeletal remains of one individual from the archaeological site of Dayr al-Barsha, present a myriad of pathological characteristics that, when considered together, fit most of the secondary skeletal symptoms expressed in chronic sufferers of type 2 diabetes.”²⁴ In Amara, an Upper-Nubian site of the New Kingdom, the excavator collected²⁵ beside the skeleton of a middle aged adult woman (Sk305-4) “a string of whitish coloured, round calcifications”, which pointed to medial vascular atherosclerosis which is a well-known complication caused by end-stage *diabetes mellitus* when the patient has reached chronic kidney failure. A similar case is published with the Dynasty 22 mummy of Nes-Ptah, a barber in the Karnak temple.²⁶ These few observations thus attest the presence of this disease in ancient Egypt.

2.2. GRAECO-ROMAN TERMINOLOGY AND TREATMENT OF DIABETES

Medieval copyists transmitted elaborate books on plants written by Greek and Roman medical writers, beginning with the father of medicine, Hippocrates (460-377 BC), who wrote 7 books based on his experience, in

23 MAGDY 2014.

24 DUPRAS ALII 2010.

25 BINDER – ROBERTS 2014.

26 MARX – D’AURIA 1986.

which a high number of medicinal and poisonous plants are described besides advice on lifestyle. Polyuria, polydipsia and polyphagia (copious urination, excessive thirst and consumption of food) are the classic triad of diabetic symptoms attributed to him.²⁷ Nevertheless, no matter how much we look in the Hippocratic Corpus for a description or treatment of the disease, we cannot find these three aspects together anywhere. However, the above-mentioned characteristic symptoms can be found in different places, although not connected, since Hippocrates writes in the Epidemics²⁸ about excessive urination compared to the fluid consumed; in his book of Prognosis,²⁹ he mentions typical diabetes phenomena in several places; and there is a word, advanced *ureticotatos*, to indicate to “*make water much or often*”,³⁰ which seems to be parallel to the ancient Egyptian excess urination (*mwyt ʕš3*). Thus, the Hippocratic writers in the antiquity knew well about polyuria, the leading symptom of diabetes, but the traditional ancient concept of diabetes had not yet developed, and the triad is a modern interpretation of the Hippocratic corpus.

Nor does Theophrastus Erezios (371-286 BC), the peripatetic philosopher, student and successor of Aristotle mention diabetes: he wrote 9 books on “*De historia plantarum*” and 6 books on “*De causis plantarum*”. These books are the oldest pharmacognosy works, and were used together with the books of Dioscorides (born in 78 BC), the Greek physician. Dioscorides is considered to be the first teacher of pharmacognosy, and his 5-volume book “*De materia medica*” contains regular and detailed descriptions of herbs, incorporating their medical use. These books served as a manual for European doctors until the modern era. Nor do we find medicaments suggested for diabetes (which is missing among the diseases mentioned) there, although several of the plants named would serve to alleviate diabetes symptoms, and fit well with the treatments of later Graeco-Roman doctors.

Among the Roman physicians, Claudius Galenus of Pergamon (Galen) (122-199 AD) made important contributions to the change in the quality of healing by developing types of pharmaceutical treatment, which are still used to this day. All his works were much appreciated in Europe until almost up to the dawn of modern medical sciences. He collected the works of numerous of his predecessors, quoted and organized their knowledge and supplemented it with his own experience and results. He mentions diabetes in several of his writings, and one of his followers, the (Pseudo-)Galenos even wrote a treatise

27 GEMMILL 1972.

28 BARACH 1928; GEMMILL 1972, 1034 refers to ADAMS 1880, 337.

29 SALOMON 187, par. 565: the life of the patient with watery urine is uncertain. It is a bad sign if someone urinates immediately after drinking.

30 It is also the way that Aristotle used it, although in connection with animals. (ERMERINS 1859, 354, par. 52, referring to Aristotle, Parts of Animals, 670b)

on this topic.³¹ Galen took over the term *diabetes* from other physicians, and used it beside the *urinary diarrhoea* and *dipsacus* (extreme thirst), finding the exact denomination less important.³² He attributed the disease to kidney malfunction, and hidden malignancy of the disease of the kidney and small intestine, and assumed it to be a rare, fatal disease. Thus, the last phase of diabetes was well known in his time, but they had no idea concerning how the process was established, nor its actual cause.

The knowledge of diabetes, however, goes back to much earlier times, to the Hellenistic Alexandrian medical school.³³ We hear that Apollonius of Memphis, from the late 3rd c. BC, had already written about it, and Demetrius of Apamea seems to have been the first to use the term *diabetes* during the 2nd c. BC. Their works are, however, not extant, and are only known from the treaty *De Morbis Chronicis* [*On chronic diseases*] of Caelius Aurelianus, living in the 5th c. AD, who transmitted a short presentation.³⁴ We learn here, that diabetes was first classified by Apollonius of Memphis as a type of *hydrops*, i.e. fluid accumulation in the human body with bad thirst and much drinking, where the terms “*sine retentione ... sine dilatione*”: “*without accumulation*” (sc. in the body) and “*without delay*” separated it from the real *hydrops*,³⁵ these being the most important later classic symptoms. The modern term diabetes was first attested – according to Caelius Aurelianus – by Demetrius of Apamea, who adopted the concept of his predecessor, and highlighted the fluid’s passing through with his new formulation,³⁶ by which he also established it as an independent disease. Concerning the explanation of the inner processes by which the liquid passes through, we can read in Cassius Felix (5th c.AD), that

31 MORAUX 1985, in ancient Greek and German.

32 Galenos, De locis affectis VI,3 (KUHNS VIII, 390-401) – ... *Non recte autem putare quosdam diabete[m] affectionem, velut et caninam cupiditatem, ad venticulum pertinere, manifestum est ex iis, qui prae nimia siti ventriculum implent et servant in ipso potionem longo tempore. Etenim qui in vehementi siti potarunt, his quatuor symptomata succedunt; unum et quidem primum vomito, alterum velox per alvum excretio, aut fluore aut intestinorum laevitate, tertium, quod potus diutius in ventriculo maneat, quartum id ipsum, de quo nunc sermo est, sive id aliquid diabete[m], sive dipsacon, sive urinae fluore[m] nominare voluerit, neque enim, ut idoneum ei nomen imponamus, sed ut curationis viam tum ex loco affecto, tum ex ipsius affectione inveniamus, scrutamur. ...*

33 CHRISTOPOULOU-ALETRA – PAPAVERAMIDOU 2008; FOURNIER 2000, 603; ORTH 1989.

34 Only his summary at the beginning of the chapter is known, because the actual work is lost.

35 Morb. Chron. III.8.101: „*Alium dixit, fieri hydropem cum retentione, ut si quid biberi, sine dilatone tanquam per fistulam transiens egeratur, eius autem quem retentione fieri dixit, secundum plurimos tres esse differentias affirmat.*”

36 Morb. Chron. III.8.102: „*Sed melius Demetrius Apameus ab hydrops discrevit, eum qui sine dilatione potum liquorem per urinam egerit, diabete[m] appellans.*”

even the internal organs are turned to liquid because of their porosity.³⁷

We have detailed explanation from the Roman physician, Rufus of Ephesos (98-117 AD). He introduced for it the term *urinary diarrhoea*, because it was a universal experience that these patients urinated immediately after drinking, and had "*incessant thirst*". He advised that among other procedures they should eat cooked vegetables, and avoid substances which promote urination.

The most detailed description of this disease, however, originates from Aretaeus, the Cappadocian Roman physician (prob. 129-199 AD), and it is still valid today. Interestingly, though even he never mentions the sweet taste or smell of the diabetic urine, and based on this it seems probable, that they did not distinguish between *diabetes mellitus* and *diabetes insipidus*. Aretaeus described diabetes as being a terrible, chronic disease, which develops over a long period of time but is a rare one. He compares it to dropsy, where again too much thin and white urine is produced by the organism, but the behaviour of the human organs is opposite: in dropsy the affected organs retain the urine, while in diabetes the kidneys excrete it directly through the body, and even the flesh is liquified, and consumed by the disease:

*"Diabetes is a wonderful affliction, not very frequent among men, being a melting down of the flesh and limbs into urine. The patients never stop making water, but the flow is incessant as if the opening of aqua ducts. Life is too short, disgusting, and painful, thirst unquenchable, excessive drinking, which, however, is disproportionate to the large quantity of urine, for more urine is passed; and one cannot stop them either from drinking or making water; or, if for a time they abstain from drinking, their mouth becomes parched and their body dry, the viscera seems as if scorched up; they are affected with nausea, restlessness, and burning thirst, and at no distant term they expire. Thirst, as if scorched up with fire... The abdomen shrivelled, veins protuberant, general emaciation, when the quantity of urine and the thirst have already increased... the disease appears to me to have the name diabetes as if from the Greek word διαβητης, because the fluid does not remain in the body..."*³⁸

Some of the plants used for treating patients with diabetes operate by alleviating the pain: *Alphitonia Endl.* (herba) (Rhamnaceae), *Vitis vinifera* (folium, fructus) (Vitaceae), *Parietaria Judaica* (folium) (Urticaceae), *Portulaca*

37 De Medicina, 46: *appellatur a Graecis diabetes, siquidem mox potione accepta per urinales vias raritate membrorum interiorum descendat tamquem per inania feratur. „Its called through-passer by the Greeks because, in fact, immediately after drinking the fluid is avacuated again through the urinary tract because of the porosit of the internal organs, as if it were pouring through an empty space".* (447 AD) ORTH 1989, 114.

38 ARETAEUS 1997, 203-207. (*Therapeutics of chronic disease* II.2.485-486)

oleracea (folium) (Portulacaceae), *Rosa canina* (oil) (Rosaceae), *Bistorta officinalis* (fructus) (Polygonaceae), *Inula helenium* L. (herba) (Asteroideae), *Phoenix dactylifera* L. (fructus) (Arecaceae), *Myrtus communis* or *nivelli* (fructus) (Myrtaceae), *Pyrus* L. (fructus) (Rosaceae), *Nardostachys jatamansi* (herba) (Caprifoliaceae), *Pistacia lentiscus* (gummi) (Anacardiaceae), *Cydonia oblonga* Mill. (fructus) (Rosaceae), *Vachellia seyal*, *Acacia tortilis*, *Faidherbia albida* (folium) (Fabaceae), *Cytinus hypocistis* (Rafflesiaceae), *Quercus* L. (fructus: acorn and gall) (agaceae), *Punica granatum* (flos and fructus) (Punicaceae), *Cichorium endivia* (folium) (Asteraceae), *Castanea* Mill. (fructus) (Fagaceae), *Umbilicus rupestris* (herba) (Crassulaceae).

2.3. INDIAN METHOD FOR TREATING DIABETES

Charaka as an ancient doctor created his work around 1000 BC. He drew attention to the importance of nutrition, adherence to hygiene, disease prevention, and “health education”. There are 500 herbs in his study, the *Charaka Samhitā*.³⁹ Another Indian physician, Suśhruta lived sometime between 1200 BC and 600 BC. He is considered to be the father of surgery. Thanks to his excellent anatomical knowledge, he described 1100 diseases but also more than 760 herbal drugs in the *Suśhruta Samhitā*,⁴⁰ the other principal work of the “great triad” of traditional Ayurvedic medicine. The third is the *Ashtanga Hridayam Samhitā* and the variation *Ashtanga sangraha*, written by Vagbhata, who lived probably in the 6th century AD., which is a synthesis of Ayurvedic medicine. Ayurvedic medicine influenced Avicenna (11th c. AD) who in his turn, influenced the Arab-Persian medicine in general, and through it later Latin works. It also contains many medicinal plants.

According to these works, ether, air, fire, water, and earth are the five elements that constitute the body. These combinations make up the *prakriti* (constitution, physique, nature), which can be grouped into three *doshas* (principles): *vata* (movement), *pitta* (transformation), *kapha* (lubrication and stability). Research by Govindaraj and co-workers showed a strong correlation between genetic pattern and *prakriti*.⁴¹ It also showed, that *kapha* characteristics (earth & water), such as stocky and overweight individuals, are prone to *diabetes mellitus*.⁴²

In diabetes, the heart, kidneys, brain, pancreas, liver, muscle and macrophages, adipose tissue and microbiome are all affected, therefore gastrointestinal-mediated glucose disposal is needed. As *Suśhruta Samhitā*, book 2 (Pathology), ch. 6, 33-34 describes, “A *madhumeha* patient seeks a

39 AGNIVESA 1992.

40 SUSHRUTA 1992.

41 GOVINDARAJ ET ALII 2015.

42 SINGH ET ALII 2022.

halting place while walking, wants a place to sit on while halting, lies down if he finds a sitting place, and sleeps if he lies down."⁴³

Ayurvedic medicine attempts to create an algorithm for the management of the disease, which means both purification and palliative treatment, besides lifestyle change. Purification means purgation and emesis, and by this, the expulsion of *ama* ("undigested, unripe"), morbid *kleda* ("moist"),⁴⁴ vitiated *doshas* and tissues from the body, and to kindle *agni* ("fire").⁴⁵ The distinct *agni*-types (there are about 40) are the intelligent force in each cell, the impairment of which causes an imbalance in the body and by this, disease (*amaya*). Diet, lifestyle and emotions all affect *agni's* operations, which can be destroyed by the disease-causing *ama*, the toxic waste, especially if it accumulates, by creating any kind of imbalance. This is also the root of the elevated urine (and blood) sugar. The elimination of *ama* is a basic need. To clear it, there are several ways.

Although the approaches of phytotherapy and Ayurvedic medicine to diabetes are completely different, the results are almost identical. *Madhumeha*, "sweet urine" is considered in Ayurveda a *yapya*, i.e. an incurable disease, or one which is difficult to cure. With the treatment, however, patients can often be given sufficient amelioration of the condition to live a long life (*deergha jeevanam*) to an adequate, healthy (*sukhayu*) level.⁴⁶ The treatment uses herbal and animal compounds, metals and minerals and different compound formulations, which normalize the *doshas*, promote the digestion of *ama*, dry up the morbid *kleda*, heal damaged tissues, kindle *agni* and normalize the function of *vasti* (*enema*). Thus, they prevent the manifestations of the condition, treat the illness, and reduce complications.⁴⁷ The hundreds of herbs for treating *diabetes mellitus* are classified in distinct groups for bitter taste, warm potency, and light and dry properties found in the above listed Ayurvedic books.⁴⁸

Known as important Ayurvedic antidiabetic plants are:⁴⁹ *Aegle marmelos* (folium, cortex, radix, fructus, semen) (Rutaceae), **Aloe barbadensis* (folium) (Asphodelaceae), *Alstonia scholaris* (folium, cortex) (Apocynaceae), *Andrographis paniculata* (folium, radix) (Acanthaceae), **Azadirachta indica* (fructus, semen) (Meliaceae), *Drynaria quercifolia* (rhizoma) (Polypodiaceae),

43 BHISHAGRATNA 1911, 49.

44 PRASAD 2018.é

45 UIKEY – KAR 2015.

46 SRINIVAS ET ALII 2014.

47 KOROSSY – BLÁZOVICS 2016a.

48 KOROSSY – BLÁZOVICS 2016b.

49 KUMAR ET ALII 2017; SUDHA ET ALII 2011; MUKHERJEE ET ALII 2006.

Catharantus roseus (folium) (Apocynaceae), *Cinnamomum zeylanicum* (cortex) (Lauraceae), *Clerodendrum viscosum* (folium) (Verbenaceae), *Coccinia indica* and *Coccinia grandis* (fructus, folium, radix) (Cucurbitaceae), *Cuscuta reflexa* (caulis) (Cuscutaceae), *Enhydra fluctuans* (folium, caulis) (Asteraceae), *Ficus racemosa* (flos, fructus, folium, cortex) (Moraceae), *Gymnema sylvestre* (folium) (Asclepiadaceae), **Lannea coromandelica* (folium) (Anacardiceae), *Momordica charantia* (fructus) (Lamiaceae), *Ocimum sanctum* (folium) (Lamiaceae), *Phyllanthus emblica* (fructus) (Euphorbiaceae), *Syzygium cumini* (fructus) (Myrtaceae), **Tribulus terrestris* (crop) (Zygophyllaceae), *Vitex nigundo* (folium) (Lamiaceae). – Plants marked with an asterisk (*) are not recommended for use in food supplements by the Expert Board of OGYÉI (National Institute of Pharmacy and Nutrition) in Hungary.

2.4. CHINESE TERMINOLOGY AND TREATMENT OF DIABETES

The 1985 edition of the Chinese Pharmacopoeia has two volumes: one for traditional Chinese preparations and one for Western pharmaceuticals.⁵⁰ And indeed, traditional Chinese medicine (TCM) originates in the legendary past, millennia ago. The *Huang-di nei-jing* (“*The Yellow Emperor’s Classic of Internal Medicine*”), also known as the *Nei Jing*, is considered to be the first Chinese medical book, but its refined version (*Chong guang bu zhu Huangdi neijing su wen*) is still a basic in today’s traditional medical practice in China.⁵¹

Here the Yellow Emperor, the mythical ancestor of the Chinese kings, seeks information from his chancellor, Qi Bo on all questions of health and the art of healing. It is the source of all later Chinese medical theories. Originally the opus contained four volumes, but only two are extant, just fragments of the others survived. Presumably, they fell victim to the book-burning (213 BC) of King Qin Shi Huangdi (259-210 BC). The missing volumes discussed the life of the Thunder god Lei Shen, the Jade god Yu Shen, the Yellow Emperor and Qi Bo. The second volume discusses acupuncture therapy, the first one is the *Su wen* [*Plain questions*]. Still today, its commented and refined version is in China the most important handbook used in traditional medical education for the rules and explanations.⁵² Diabetes, “*waisting-thirst*” in old Chinese, is first mentioned in this Taoist medical treaty, dated between 475-221 BC (late Warring States period). The main symptoms are said to be polydipsia, polyphagia, polyuria and weight loss. Later three subphases were determined, and diagnosis and treatment further refined. Although the understanding of the *waisting-thirst* developed by now in three more stages,⁵³ the essence is still the

50 For a summary work see e.g. UNSCHULD – TESSENOW 2011.

51 BLÁZOVICS 2018.

52 Last English translation: UNSCHULD – TESSENOW 2011.

53 ZHANG ET ALII 2010.

same as we can find it in this work.

The *Su wen* seems to be written by several authors and edited into one dialogue. It discusses the medical questions based on the mature *yin-yang* and 5 elements system. In this book, 252 herbs⁵⁴ are mentioned in connection with the *wasting-thirst* disease. In the case of “*Maple syrup urine disease*”, the doctor will recommend cooked vegetables and complex carbohydrates. Obesity is there considered to be one of the major risk factors. The physiological explanation is given by the observation that a high-fat diet causes stagnation in the liver, which affects the balance of the spleen and pancreas. The goal of the diet is thus to restore the balance of the spleen-pancreas group and the yin.⁵⁵

Traditional Chinese medicine traces type 1 and 2 diabetes back to yin insufficiency: for the disease of the spleen-pancreas axis and for heated overload in the lungs. They thus deduce that *diabetes mellitus* is a yin disease – a result of malnutrition, emotional problems, overload and increased sexuality. The main pathogenesis lies in fluid consumption of a yin nature, which causes endogenous dry heat, blood stasis, and retention of lubricating secretions in the body. If the protracted yin deficiency harms the value of the yang, it will also be present in ever-smaller proportions. Finally, these changes affect both Qi and yin.⁵⁶

Traditional Chinese medicine has exploited and continues to exploit the ever-increasing treasury of herbal medicine.⁵⁷ Nowadays state-of-the-art analytical methods are used to determine the structure of biologically active molecules in formulations and to investigate their mechanism of action using a wide range of biomedical and molecular biological methods. The toxicity of drugs is being studied. They are necessarily related to the advanced healing techniques used in the Western world in recent decades.⁵⁸

Some Chinese antidiabetic plants are: *Alisma orientale* (tuber) (Alismataceae), *Allium sativum* (bulbus) (Amaryllidaceae), *Anemarrhena asphodeloides* (rhizoma) (Liliaceae), *Atractylodes lancea* (rhizoma) (Asteraceae), *Astragali Radix seu Hedysari* (Fabaceae), *Coptis chinensis*

54 Cf. The *Shennong Bencao Jing*, “*Divine Farmer’s Classic of the Materia Medica*” (100-200 AD), the oldest Chinese Materia Medica recorded 365 herbal drugs in all, while Li Shi-zhen, *Bencao Gangmu* [Compendium of Materia Medica], contained already 1898 crude drugs of plant, animal and mineral origin (TANG - EISENBRAND 1992)

55 RAPA VI – BLÁZOVICS 2000.

56 See e.g. <http://www.itmonline.org/journal/arts/diabetes.htm>, <https://www.allthingshealth.com/en-us/general-health/energy-and-immunity/type-2-diabetes-diet/> (too much or overly frequent sexual activity depletes kidney essence and *yin* in the body.)

57 WANG 1983.

58 BLÁZOVICS 2018.

(rhizoma) (Ranunculaceae), *Cornus officinalis* (fructus) (Cornaceae), *Lycium barbarum* (fructus) (Solanaceae), *Panax ginseng* (radix) (Araliaceae), *Polygonatum officinale* (rhizoma) (Asparagaceae), *Pueraria lobata* (radix) (Fabaceae), *Trichosanthes kirilowii* (semen) (Cucurbitaceae).⁵⁹

ARAB / PERSIAN MEDICINE FOR DIABETES

An outstanding scientist of the Golden Age of Islam (8th-14th century) was Abu Ali al-Husayn ibn Abd Allah ibn Sina⁶⁰ (980-1037 AD) from Bukhara, called Avicenna in the Latin translations of his works. He was the first experimenter scientist, physician and polymath, who emphasized the importance of the state of mind in preventing disease and increasing vitality and educating for a proper lifestyle. His most significant scientific work is the five-volume *Canon of Medicine*, written between 1013 and 1021. It also conquered Western Europe and more than 30 editions of that were circulated until the 17th century.⁶¹ Avicenna's work was influenced by both ancient Graeco-Roman⁶² and Far Eastern medicine, but he also drew much from the medical works of his prominent predecessor, the Persian Muhammed ibn al-Rāzī (Rhazes, 854-925 AD). The teachings of ancient Greek and Roman authors arrived in Persia via the Silk Road. At the same time, Arabic knowledge also reached Europe. These mutual contacts provided an opportunity to learn about contemporary European medical activity as well. Avicenna emphasized the importance of maintaining health. His teachings on lifestyle change coincide with both Ayurvedic and Chinese teachings, as exemplified by the 11-part medical paper from the tomb of Ma Wang Dui (Han Dynasty) found in 1973 in Hunan Province of China, which discusses the importance of exercise, the importance of eating, and the method of acupuncture.⁶³ Avicenna summed up his advice on proper living, including eating, which is very similar to the recommendation of Harvard University in 2008.⁶⁴

Ibn Sina described the precise symptoms of diabetes: he mentions copious and frequent urination, constant thirst, increased appetite, and the patient's deteriorated condition and emphasizes that this disease is often accompanied by gangrene. He says that the urine is transparent, heavy and abundant, and after evaporation, moisture remains, which "*tastes as sweet as honey*".⁶⁵ This is an essential tool in dietetics, which coincides in many cases

59 TANG – EISENBRAND 1992.

60 BLÁZOVICS 2016,

61 BLÁZOVICS 2016; BIRTALAN 1980; SAYILI 1939.

62 GUTAS 1988, 12.

63 HARPER 1998; BUCK 1975; <http://tundeworld.com/MaWangDuiDaoYiShu-GuidingQi>.

64 <https://www.hsph.harvard.edu/nutritionsource/>

65 PETROV 1982. _

with medication in his teachings. In his encyclopedia *The Canon of Medicine*, he prescribed for people with diabetes an herbaceous blend of lupine (*Lupinus albus* L., a legume with edible peas and gaudy flower spikes), fenugreek (*Trigonella foenum-graecum* L., a small herb with pungent yellow seeds) and zedoary or white turmeric (*Curcuma zedoaria* (Christm.) Roscoe, wetland crop, whose roots taste like ginger with a bitter aftertaste). Altogether, these herbs made more than an aesthetically formidable bouquet: they worked! At least a little. He was among the first to have any success treating diabetes medicinally: people with diabetes who consumed this blend would excrete less sugar, and their symptoms would grow less severe. It is likely that fenugreek was the most helpful ingredient; recent studies have suggested (but not proven) that its yellow seeds can stimulate insulin production in both people with type 1 and type 2 diabetes. In any case, Avicenna could buy his patients a little time.

Concerning the urinary tract⁶⁶ and liver,⁶⁷ there are also many other old Arabic writings, which agree with the bases of modern medicine. As the Canon was used extensively in the Arab world, a number of Ayurvedic and traditional Chinese medicine herbs, listed there, were incorporated. Also the *Allium sativum* (tuber) (Amaryllidaceae), *Inula helenium* (radix) (Asteraceae), *Taraxacum officinale* (radix, folium) (Asteraceae) were considered to be of particular importance in the treatment of diabetes, and are currently used worldwide.⁶⁸

3. SOME HERBS AND THEIR BIOACTIVE COMPOUNDS ARE STILL USED TODAY TO TREAT DIABETES MELLITUS

The vast majority of the world's population uses herbs to prevent and cure various diseases. Approximately 1200 plants are used worldwide to treat *diabetes mellitus*. Some of these plants have been known in ancient times on various continents. For centuries, widely used antidiabetic plants include species from Acanthaceae, Anacardiaceae, Apiaceae, Apocynaceae, Asclepiadaceae, Asphodelaceae, Asteraceae, Bignoniaceae, Cucurbitaceae, Cuscutaceae, Cyperaceae, Euforbiaceae, Fabaceae, Lamiaceae, Lauraceae, Liliaceae, Meliaceae, Moraceae, Myrtaceae, Polypodiaceae, Rozaceae, Rutaceae, Urticaceae, Verbenaceae, Zygophyllaceae families.⁶⁹

3.1. ALISMA ORIENTALE (TUBER) (ALISMATACEAE)

In a study,⁷⁰ *Alisma orientale*, the water bridge guard, proved to be

66 CHANGIZI ET ALII 2011.

67 MAHDAVI ET ALII 2015.

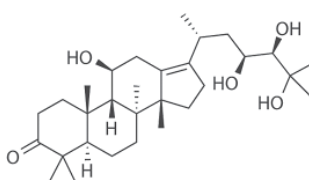
68 BLÁZOVICS 2016.

69 MARLE – FARNSWORTH 1995.

70 MA ET ALII 2014.



Photo: <https://www.plantarium.ru/page/image/id/712207.html>



alisol

the most beneficial in improving insulin uptake. It is a species belonging to the *Alismataceae* family of water bridgeheads. As a swamp plant, it lives half-submerged.

The triterpenoids content in *Alisma orientale* are alisol A, alisol A 24-acetate, alisol B, alisol B 23-acetate, alisol C 23-acetate, alisol F, alisol F 24-acetate, and alisol G. The hypolipidemic effect of the triterpenoids is mediated mainly through alteration of the gut microecology and the regulation of genes involved in cholesterol metabolism, especially Insulin-induced gene 1 protein (Insig1).⁷¹

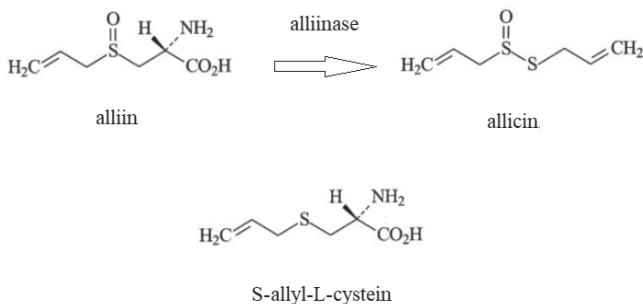


Photo by the authors

3.2. *ALLIUM SATIVUM* (BULBOUS) (AMARYLLIDACEAE)

Garlic is an important herb in Ancient Egyptian, Ayurveda and TCM medicine. The dietary implications of onion are already known from records of the construction of the Egyptian pyramids as transmitted by Herodotus, but it was also found in Tutankhamun's tomb. Its application is due to its healing effects:

the main active ingredients are alliin and allicin.⁷²



Research in animal experiments confirms that an extract of garlic bulb with an ethanolic solution administered orally approaches the efficacy of tolbutamide in the

treatment of diabetes.

71 XU ET ALII 2020.

72 AUGUSTI 1996.

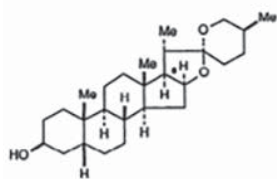
Allicin activates the signaling mechanism of insulin, which regulates glucose metabolism and aids in cellular glucose uptake.

3.3. *ANEMARRHENA ASPHODELOIDES* (RHIZOME) (LILIACEAE)

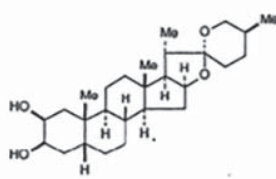


The rhizome of *Anemarrhena asphodeloides* (*Zhi Mu*) is a drug of traditional Chinese medicine used for its hypoglycemic effect. The rhizome has been used for a long time. In addition to the hypoglycemic effect, it has anti-fungal, antiseptic, diuretic, expectorant, laxative, sedative and tonic properties. Therefore, patients' diarrhea should not be treated with this drug; generally, it should be given with caution, because it can cause a sudden drop in blood pressure.

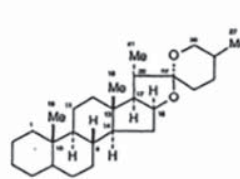
Photo: <https://duiyaoonline.com/herbs/zhimu.htm>



sarsapogenin



markogenin



spirostane

Its bioactive composition mainly consists of proteins, carbohydrates, steroidal saponins, flavonoids, xanthenes and norlignans. The major small molecules are steroidal saponins, xanthenes and norlignans. The main constituents of the rhizoma are saponins and sapogenins of a steroid nature, especially sarsapogenin and its glycosides.

The sapogenins isolated are sarsapongenin and markogenin. They are derived from spirostane. Anemaran as the active component has hypoglycemic activity. Neutral anemaran A, B, C and D showed a better hypoglycemic effect than acid anemaran. Polysaccharides of this rhizome markedly inhibited growth of cancer cells directly as well.

3.4. *ASTRAGALI RADIX SEU HEDYSARI* (FABACEAE)

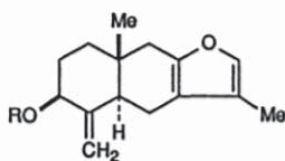
Radix astragali (*Huangqi*) is an herbal remedy used in China to treat patients with diabetes who are exposed to repeated episodes of hypoglycemia. It amplifies the glucose counterregulatory response to hypoglycemia. After immunocytochemistry studies, the researchers conclude that *radix astragali*



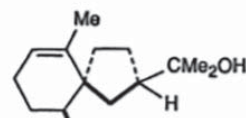
treatment can amplify the counterregulatory response to hypoglycemia through a mechanism that may involve the central glucose-sensing regions, therefore the potential therapeutic benefit of radix astragali in type 1 diabetes could be warranted.

Photo: <https://www.digin.in/index.php?r=search/searchproducts&prid=29115>

3.5. *ATRACTYLODES LANCEA* (RHIZOMA) (ASTERACEAE)



hydroxyattractylon R = H
acetoxyattractylon R = Ac



hinesol

Photo: <http://www.epharmacognosy.com/2020/05/atractylodes-lancea.html>

Atractylodes lancea (Cangzhou) rhizome is also listed in the Chinese Pharmacopoeia. This herb is used in East Asia. The dry radix stock is collected in spring and autumn. This rhizome is recommended for the treatment of digestive disorders, diarrhea, edema, beriberi, rheumatic diseases, influenza, and nyctalopia. The administration of *Atractylodes lancea* reduces hyperglycemia and hyperlipidemia risk in animal experiments. From the rhizoma of *Atractylodes lancea*, hydroxyattractylon, acetoxyattractylon and hinesol were isolated.⁷³

3.6. *AURICULARIA AURICULA-JUDAE* (AURICULARIACEAE)

Active ingredients are water-soluble polysaccharides, cellulose, chitin, pectin, uronic acid, amino acids and minerals. It contains almost all the essential amino acids. Gallic acid and caffeic acid as the major antioxidants can be found in this mushroom.

The mushroom⁷⁴ contains proteins, fats and carbohydrates. Mono-

73 TANG – EISENBRAND 1992; HAN – CHOI 2020.

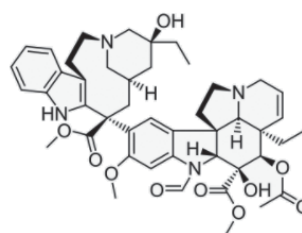
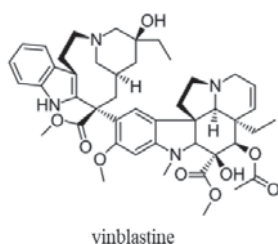
74 JEONG ET ALII 2007.

Plants are not recommended for use in food supplements by the OGYÉI Expert Board.

3.8. *CATHARANTHUS ROSEUS* (FOLIUM) (APOCYNACEAE)



Photo: <https://kertszepites.com/rozsameteng/>



The leaves of (*Apocynaceae*)⁷⁶ contain indole alkaloids, vinblastine and vincristine, which are potent cytotoxic alkaloids. Therefore, due to its blood glucose-lowering effect, which rivals that of glibenclamide and metformin, it could be an important drug, but its use is not recommended by the OGYÉI Expert Board.

3.9. *CINNAMOMUM CASSIA* (CORTEX) (LAURACEAE)



Cinnamomum zeylanicum (<https://www.pioneerherbal.com/cinnamomum-zeylanicum/>)



Cinnamomum cassia (<https://www.alembics.co.nz/product/cassia-bark/>)

Cinnamon is a spice and herb from Southeast Asia. The Chinese have used cinnamon preparations in the treatment of type 2 diabetes for centuries. It can be found in two forms: in Gui Zhi and Rou Gui preparations. The main compounds of *Cinnamomum cassia* are: flavanols, coumarins, cinnamic acid, cinnamoyl esters, cinnamaldehydes coumarin aldehyde, coumarins, β -sitosterol, choline, protocatechuic acid, vanillic acid and syringic acid. It is rich in essential oils.⁷⁷

76 AL-SHAQHA ET ALII 2015.

77 ZHU 1998; HARADA – OZAKI 1972.

Previous studies have found that cinnamom aldehyde is an antidiabetic agent, and cinnamom effectively affects carbohydrate and lipid metabolism and reduces hemoglobin A1c (HbA1c) levels in type 2 *diabetes mellitus*.

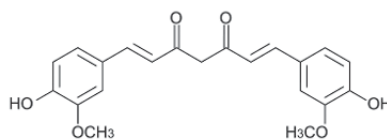
These effects are also supported by polyphenolic compounds. The biologically active components of cinnamom are able to regulate blood glucose levels through their insulin-mimicking properties by enhancing insulin receptor kinase activity, insulin receptor autophosphorylation, and glycogen activity, resulting in increased glucose uptake. Essential oils made from cinnamom have shown to be bactericidal and fungicidal effects.⁷⁸

Many countries have restricted the regular use of *Cinnamomum cassia* due to the significant toxicity of the coumarins. Clinical studies initiated in 2017 to confirm the antidiabetic effect of *C. zeylanicum* extract have not yet been completed according to our current literature review.⁷⁹

3.10. *CURCUMA LONGA* (RADIX) (ZINGIBERACEAE)

*Curcuma longa*⁸⁰ is recommended for digestive difficulties, circulatory insufficiency, joint problems and various skin diseases. Curcumin, demethoxycurcumin and bisdemethoxycurcumin are the main biologically active components of this drug. Alcoholic extract of *Curcuma longa* inhibits lipogenesis by reducing the expression of fatty acid synthetase, acetyl-CoA carboxylase, lipoprotein lipase, stimulates lipolysis and beta-oxidation, inter alia, by increasing the expression of hormone-sensitive lipase and phosphorylating AMP-activated protein kinase.

Curcumin alleviates the syndromes of neuropathy, nephropathy, diabetic retinopathy by inhibiting oxidative stress-induced inflammatory processes, including by inhibiting the entry of NF-κB signal transduction protein into the nucleus, thereby reducing inflammatory endothelial effects.



curcumin

Photo: https://hu.m.wikipedia.org/wiki/F%C3%A1jl:Curcuma_longa_roots.jpg

78 CRAWFORD 2009.

79 Trial registration: Sri Lanka Clinical Trials Registry (SLCTR), identifier: SLCTR / 2017/010 (<http://slctr.lk/trials/714>) Registered on 5 April 2017; study protocol version 3.1 21 March 2017. See also BLÁZOVICS – HÉTHELYI 2020.

80 MARQUARDT ET ALII 2015.

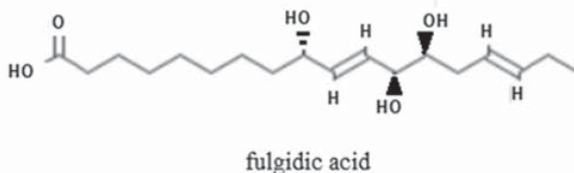
3.11. *CYPERUS ROTUNDUS* (TUBER) (CYPERACEAE)



Photo: <https://www.eattheweeds.com/tag/cyperus-rotundus/>

The plant is mentioned in ancient Egyptian and Indian Ayurvedic medicine (Charaka Samhita). Modern Ayurvedic medicine also uses the plant, e.g. in gastrointestinal disorders. In Arab countries fried tubers are consumed even now. Dioscorides, Galenus, Rhazes and Avicenna have also described their beneficial properties e.g. in gastric diseases and as emollients.

The fulgicidic acid content of *Cyperus rotundus*⁸¹ influences the production of inflammatory cytokines, PGE2 expression as well as NO formation. The antibacterial properties of tubers prevent tooth decay.



3.12. *COPTIS CHINENSIS* (RHIZOMA) (RANUNCULACEAE)

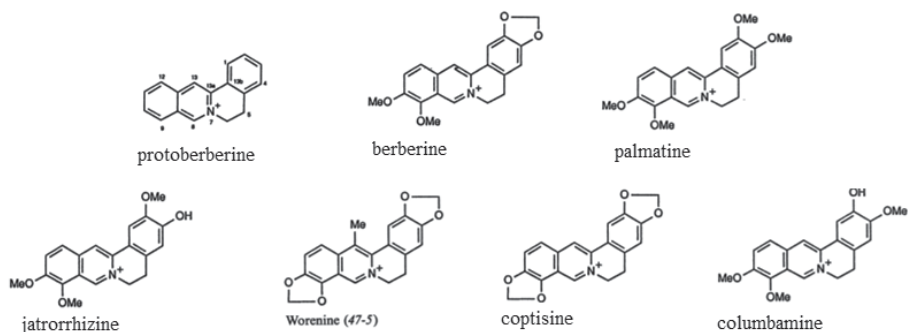
Coptis (Huanglian) rhizome⁸² is one of the most well known and widely used herbs in traditional Chinese medicine. It has bacteriostatic, antipyretic, and antiphlogistic effects. It is used in several diseases, for the treatment of gastroenteritis, diarrhoea, vomiting, icterus, fever, insomnia, haematemesis, nose bleeding, conjunctivitis, toothache, carbuncle, abscess and as a bitter digestive for the treatment of indigestion. It is used for the treatment of eczema by external application. The number of alkaloids have been isolated from the rhizome, especially quaternary proto-berberine type alkaloids.



Photo: <http://www.epharmacognosy.com/2012/04/coptis-root-huanglian-coptis-chinensis.html>

81 PIRZADA ET ALII 2015.

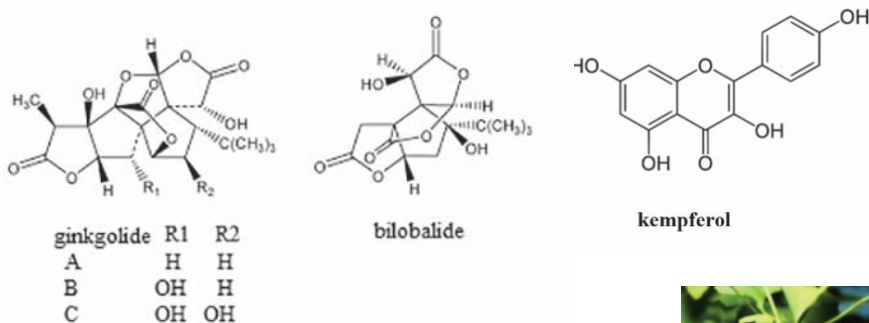
82 TANG – EISENBRAND 1992; BAJPAY ET ALII 2019.



The Chinese formula Tang-Min-Ling (TML), an improved product of the decoction of Dachaihu which has a history of more than 2000 years, has as its main constituents the *Coptis chinensis*, *Scutellaria baicalensis*, *Rheum officinale* Baill and *Bupleurum chinense* DC. A multicentral randomized controlled investigation has shown that TML has positive effects on regulating glycometabolism in type 2 diabetes patients, but the mechanisms remained unclear.⁸³

3.13. GINKGO BILOBA (FOLIUM) (GINKGOACEAE)

The leaves of Ginkgo biloba contain flavonoids, terpenoids and



proanthocyanides. The main flavonoid component is kempferol. Terpenoids include ginkgolide and bilobalide. The active terpenoid and flavonoid ingredients have synergistic effect. The leaves contain different compounds in different seasons: ginkgolide A, B, C (diterpene lactones / depends on the age of the tree), flavonol glycoside (rutin, isoquercitrin, kempferol glycoside



Photo: https://www.fitoland.hu/kategoriak/fak_52/pafranyfenyo_15007

83 ZHEN ET ALII 2011.

/ spring leaves), biflavone (amentoflavone, ginkgetin, sciadopitizin / autumn leaves), procyanidins / autumn leaves.

It has vasodilator, antioxidant and anti-inflammatory effects. It improves cerebral blood supply, increases mental capacity and concentration. *Ginkgo biloba* extract as an adjuvant was effective in improving metformin treatment outcomes in type 2 diabetes mellitus patients.⁸⁴

3.14. *INULA HELENIUM (RADIX) (ASTERACEAE)*

It is a well-attested Graeco-Roman drug for diabetes, and Avicenna also suggested its use. The active ingredients in *Inula helenium* (Armenian root) are inulin, essential oils and mucus. It also contains polyoils containing sesquiterpene (alantholactone).

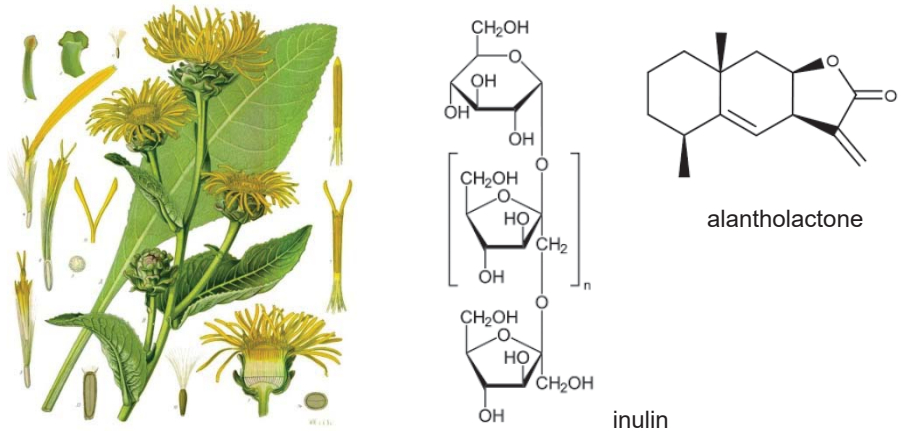


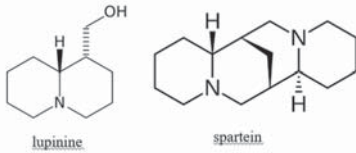
Photo: <https://hu.wikipedia.org/wiki/Örménygyökér>

It increases bile production and is also known as a urinary tract disinfectant. (Bile acids and their bile salts are synthesized from cholesterol by hepatocytes.) It can be used to treat patients with *diabetes mellitus*. It is used externally to treat skin diseases of fungal origin. *Inula racemosa* was more effective than *Cinnamomum tamala* for diabetes mellitus in a human clinical study.⁸⁵

84 AZIZ ET ALII 2018.

85 SINGH ET ALII 1985.

3.15. LUPINUS PERENNIS (FRUCTUS) (FABACEAE)



Lupinus is characterized by the presence of isoflavones, which are lipid-lowering compounds. The *Lupinus albus* has a beneficial effect in controlling diabetes by reducing fasting and post-prandial glucose and enhancing insulin sensitivity.⁸⁶ Caution needs, however, because of the toxic alkaloids, e.g. lupinine, sparteine. The fruit is a pod containing much semen, similar to beans. It was an important drug in diabetes treatment of Avicenna with trigonella and zedoaria.

Photo: <https://www.everwilde.com/store/European-Lupine-Wildflower-Seeds.html>

3.16. MALUS DOMESTICA (FRUCTUS) (ROSACEAE)

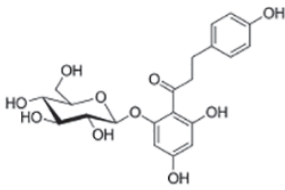


Photo: *Malus domestica* Borkh. in KÖHLER 1897, without number.

Interestingly, the apple is not mentioned in either culture, although the antioxidant vitamins and provitamins found in the plant can improve the quality of life of diabetics by influencing signaling pathways.

The main bioactive ingredients of apples are polyphenolic compounds. Important chalcones are floretine and florizine. Florizine (2'-glucoside of floretin) belongs to the dihydrochalcone group of flavonoids. It can inhibit both renal and intestinal glucose absorption, resulting in a reduction in blood glucose levels. Recent research confirms that at lower concentrations it also induces the expression of hepatic genes that result in the synthesis of carbohydrate and fat metabolism-related proteins. SGLT1 is a high-affinity and low-capacity sodium / glucose co-transporter-1 in the small intestine,

86 BOUCHOUCHA ET ALII 2016.



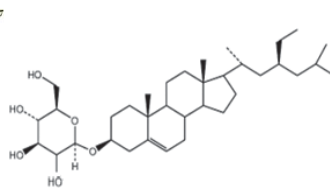
florizine

while SGLT2 is a major, low-affinity high-capacity sodium / glucose co-transporter-2 in the kidney that is 90% involved in the reabsorption of glucose into the bloodstream; both SGLT are integral membrane proteins, that regulate glucose transport. Selective inhibition of SGLT2 is a potential strategy in type 2 diabetes.⁸⁷

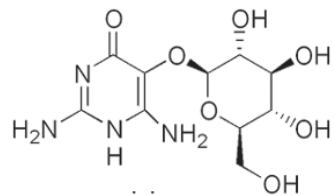
3.17. *MOMORDICA CHARANTIA* (FRUCTUS, SEMEN) (CUCURBITACEAE)



Photo: https://en.wikipedia.org/wiki/Momordica_charantia



charantine



vicin

Bitter gourd/melon is an herb of Ayurveda and again TCM. It is also known as balsam pear, or karela. It has been used as a vegetable and fruit as well as in Asian folk medicines for centuries as a remedy for diabetes by blood sugar-lowering action, and it is still nowadays widely widespread. To avoid the bitter taste the herb is crushed and formed into tablets.

Its main compound is the polypeptide-p or p-insulin, a “hypoglycemic protein”. It also contains charantin and vicin being again hypoglycemic compounds.⁸⁸ It is, however, not recommended in pregnancy due to its abortive effect!

3.18. *PANAX GINZENG* (RADIX) (ARALIACEAE)

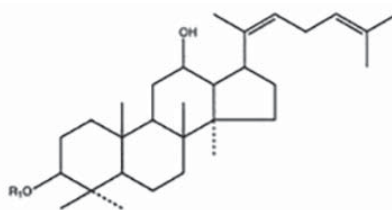
The root of the Asian ginseng has been used for over 2,000 years in the Far East. The main constituents of all ginseng species include ginsenosides (20 types of ginsenoside glycoside), polysaccharides (panaxan, ginsenan), amino acids, peptides, polyacetylenes alcohol, essential oils, tanning agent, vitamins B1, B2 and mineral elements. The most significant hypoglycemic

87 MAURICIO 2013.

88 TAYYAB ET ALII 2012-

pharmacological actions of ginseng are attributed to ginsenosides, steroidal saponins. They increase insulin sensitivity. They inhibit the development of certain complications.⁸⁹ Ginseng helps in the secretion of insulin.

Several plausible hypotheses can be proposed regarding its mechanisms of action: Ginseng may slow the digestion of food, decreasing the rate of carbohydrate absorption into portal hepatic circulation, and may affect glucose transport, which is mediated by nitric oxide (NO), but also ginseng may modulate NO-mediated insulin secretion. (NO stimulates the glucose-dependent secretion of insulin in islet cells.)



damaran skeletal triterpene glycosides

Photo: <https://www.alchemicabotanica.com/products/ren-shen-white-ginseng-root>

But, the side effects of *Panax ginseng* root above 3 g are nervousness, insomnia, hypertension, diarrhea, euphoria, above 15 g: confusion, above 25 g: severe headache, nausea and vomiting. Co-administration is prohibited with anticoagulants, aspirin, nonsteroidal anti-inflammatory drugs, corticosteroids, digoxin, monoamine oxidase inhibitors (used to treat depression), antidiabetics (with increasing hypoglycemia) and in estrogen replacement therapy. The possibility of hormone-like or hormone-inducing effects cannot be ruled out.⁹⁰

3.19. *PUERARIA LOBATA* (RADIX) (FABACEAE)

The dry root of *Pueraria lobata* Willd. is officially listed in the Chinese Pharmacopoeia and used as a muscle relaxant, antipyretic, antidiarrheic, and for the treatment of hypertension.

Chemical constituents: The major active principles in the root are isoflavone derivatives, puerarin, daidzein, daidzin and daidzein-7,4'-diglucoside. Daidzin and daidzein-7,4'-diglucoside are O-glucosides of daidzein

⁸⁹ LEE 1999; HUANG 1999; ATTELE ET ALII 1999.

⁹⁰ DEY ET ALII 2002.

and puerarin is a C-glucoside of daidzein. Formononetin, 3'-hydroxypuerarin, 6"-O-Dxylosylpuerarin, 3' -methoxypuerarin, puerarin 4' -O-D-glucoside and 8-C-aposyl-(1-6)-glucosides of daidzein and genistein are further isoflavones and isoflavone glycosides. A coumestan derivative puerarol was also isolated and glycosides, and a number of saponinins with an oleanane skeleton were



isolated. Three new compounds, kudzusapogenol A, kudzusapogenol B and kudzusapogenol C are structurally determined. Further four known compounds are being identical with sophoradiol, cantoniensistriol, soyasapogenol A and soyasapogenol B.⁹¹

Photo: <https://www.officialiserboristeria.it/en/negozio/kudzu-root-pueraria-lobata-lour-merr/>

3.20. *REHMANNIA GLUTINOSA* (RADIX) (OROBANCHACEAE)

Traditional Chinese (*shēng dì huáng*) medicine is known for thousands of years for having a yin-strengthening effect, which relieves the symptoms of diabetes.

Important active ingredients of *Rhemannia glutinosa* are iridoids and iridoid glycosides, catalpol, dihydrocatalpol, acetylcatalalpol, rehmannioside A, B, C, D, rehmanglutin A, B, glutinoside, sugars, stachyose, glucose, fructose, raffinose, galactose; organic acids are benzoic acid, caprylic acid, 3-methoxy-4-hydroxybenzoic acid, cinnamic acid, oleic acid, linoleic acid, palmitic acid, stearic acid, octanoic acid, nonanoic acid, decanoic acid, lauric acid, tetradecanoic acid, pentadecanoic acid, heptadecanoic acid, heptadecanoic acid, behenic acid, 15 amino acids, mainly alanine. Other compounds include β -sitosterol, stigmasterol, campesterol, D-mannitol.



Photo: ZHANG ET ALII 2008.

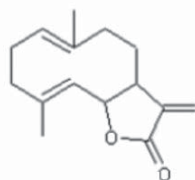
Significant metal elements are iron, zinc, manganese, chromium and 20 different trace elements. It is often given due to kidney yin insufficiency and diabetes.⁹²

91 TANG – EISENBRAND 1992, 798 *Pueraria lobata* (Willd.).

92 QIN ET ALII 2018; KIM ET ALII 2008.

3.21. *SAUSSUREA LAPP* (RADIX) (ASTERACEAE)

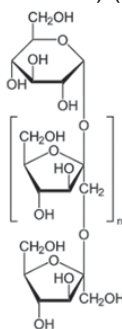
An alcoholic extract of *Saussurea lappa* root inactivates the transcription factor AP-1, which has been demonstrated in animal experiments. The costunolide (germacrene type, 10-membered monocyclic sesquiterpene lactone) inhibits the expression of IL-1 β mRNA, contributing to the anti-inflammatory effect. An aqueous extract of the root of *Saussurea lappa* has a hypolipidemic effect when administered orally in animal experiments, significantly reducing serum triglyceride and cholesterol levels.⁹³



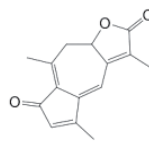
costunolide

Photo: JULURI ET ALII 2018.

3.22. *TARAXACUM OFFICINALE* (RADIX, FOLIUM) (ASTERACEAE)



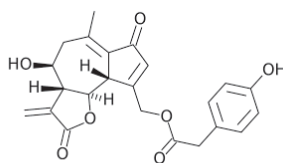
inulin



taraxacin

Photo: <https://greenhuiz.com/products/taraxacum-officinale-dandelion-seeds>

The dandelion root and leaves contain inulin, taraxacin (sesquiterpene lactone) bitter matter, rubber, wax, sugar, fat, tannin, essential oil, choline, saponin and organic acids. Vitamins are vitamin D, C and various B. In addition provitamin A were de-

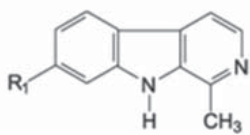


lactucopicrin

93 ZAHARA ET ALII 2014.

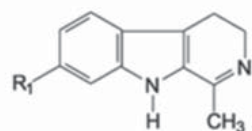
tected in its leaves. The plant is a rich source of metals and minerals (iron, silicon, magnesium, zinc and manganese), and inhibit alpha-glucosidase. Due to its fructose content, it can be consumed by diabetics. It contains lactuco-picrin, a bitter substance that has a sedative effect.⁹⁴

3.23. *TRIBULUS TERRESTRIS* (FRUCTUS) (ZYGOPHYLLALES)



R₁ =

harmane	H
harmine	OCH ₃
harmol	OH



R₁ =

harmaline OCH₃

Photo: <https://hu.tcl-ingredients.com/hot-selling-products/tribulus-terrestris-extract-powder.html>

This plant has been used in folk medicine for the treatment of various diseases for centuries.

The main active components are flavonoids, alkaloids, saponins, lignin, amides, and glycosides. The fruit contains steroid saponins, e.g. tribusterone and harman alkaloids. The plant parts have different pharmacological activities including aphrodisiac, anti-inflammatory, antimicrobial and antioxidant potential. It has potential applications for immunomodulatory, hepatoprotective, hypolipidemic, anthelmintic and anticarcinogenic activities.⁹⁵

Due to the natural testosterone-boosting effect (doping, bodybuilding, hormonal effects, potency-enhancing), it can only be recommended in diabetic nephropathy under appropriate medical control.⁹⁶ Thus, it is a plant not recommended for use in food supplements by the OGYÉI Expert Board.

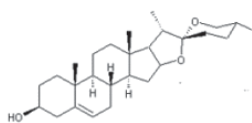
3.24. *TRIGONELLA FOENUM-GRÆCUM* (SEMEN) (FABACEAE)

Anti-diabetic and cholesterol-lowering effects have been demonstrated in fenugreek: it reduces the insulin resistance. The semen also reduces cholesterol levels (in a clinical trial by 18-26%), and therefore it can also play a significant role in the prevention of atherosclerosis and coronary stenosis. Its saponins inhibit the absorption and synthesis of cholesterol, and the fiber supports the reduction of blood sugar levels.

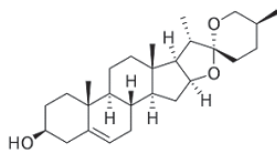
94 WIRNGO ET ALII 2016.

95 SHAHID ET ALII 2016.

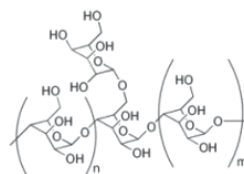
96 LUTOMSKI ET ALII 1975.



diosgenin



yamogenin



galactomannan



Photo: <https://www.diet-health.info/en/recipes/ingredients/in/gn283-fenugreek-seed>

By analysis, 4-hydroxy-isoleucine has been isolated from the semen, which is involved in preventing the development of diabetes and regulating insulin levels. Its therapeutic effect is attributed – inter alia – to the steroidal saponins, diosgenin, yamogenin, tigogenin, neotigogenin compounds and the mucus content of galactomannan, which is the main active ingredient. The drug also contains nicotinic acid, quaternary alkaloid trigonelline, choline, bitter substance and resin. It is contraindicated in pregnancy and for children under 2 years of age.⁹⁷

4. CONCLUSIONS

The teachings of ancient civilizations have accumulated much valuable knowledge which has continued to be developed over the centuries. Although the methods of approaching the treatment of diabetes were different in the ancient Mediterranean and the Middle- and the Far East, similarities and coincidences can be observed in the various cultures – and in modern phytotherapy, which is continuously investigating and further developing these materials.

Materia medica has often been chosen from the plant world and sometimes overlaps in the uses made of it. In the case of diabetes, people living in places very remote from each other, practicing Ayurveda, or traditional Chinese medicine (TCM), or in ancient times Egyptian, Graeco-Roman and Arabic/Persian medicine have used certain varieties of the same plants to alleviate the symptoms of diabetes. However, it is also true that many different plant extracts have been used, according to the geographical position and local practices of the inhabitants.

⁹⁷ XUE ET ALII 2007.

The surviving written sources give good evidence of these various practices. They display logical thinking and a practical application, and some of them if updated are applicable even today. Today, scientists are able to prove the effectiveness of a number of treatments that have developed over the centuries. By using more advanced research methods, they can further refine the application and develop more effective disease management by using the knowledge acquired through the study of ancient cultures.

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1830 1149

These plants has been cultivated in Hort. Bot. in
Copenhagen from seeds received from Paris in 1803.
To Paris came these seeds from Egypt with the label:
"Bupleurium d' Egypte Nectoux O. P. sur Ch."
O. Lagreëus.



MUSEUM BOTANICUM
HAUNIENSE



Bupleurium d' Egypte
Nectoux O. P. sur Ch.
Original collection
1803

ОБРАЗЦА ДЛЯ ФЛОРИ СССР
Bupleurum lancifolium Hornem.
Typus!
1949. Toste I. Lincevski

MUSEUM BOTANICUM
HAUNIENSE

MUSEUM BOTANICUM
HAUNIENSE



Bupleurum lancifolium
Hornem.
LECTOTYPE
Sven Snogerup Nov. 2000

Lectotype of
Bupleurum lancifolium Hornem.
Susana S. Neves Jan. 2000

Museum Botanicum Hauniense