A phytochemical analysis of some ancient narcotics, with comparative notes on some South African folk medical practices

MARLENE VAN DEN BERG
PhD (NWU)

Mini dissertation submitted in fulfilment of the requirements for the degree

PhD Latin

In the School of Biblical Studies
and
Bible Languages
at
North-West University (Potchefstroom Campus)

Promotor:
Prof. Dr. M.R. Dircksen

Co-promotor:
Prof. Dr. J. Scarborough

POTCHEFSTROOM
2008

PREFACE

Thank you:

- I would like to give all honour and love to God who gave me the strength throughout this study to complete it in time.
- My **parents**, for all their encouragement and their belief in me and my ability. They always supported me, were interested in what I did and helped me with anything for which I needed help.
- **W.L.**, my brother and personal assistant who had to run all my errands and helped me wherever he could. He did it (but at a price!).
- **Jimmy**, my Yorkie, who was satisfied to lie on the table next to the computer every night (and still loves me...)
- **Prof. M.R. Dircksen**, my supervisor who never lost courage, only wanted the best from me and led me to ideas that I could not have thought of.
- **Prof. J. Scarborough** for all his trouble, coming to South Africa twice to supervise the study with so much patience and served me with large amounts of knowledge and insight.
- **Prof. S. van Dyk**, who supervised the pharmacology in each chapter and the chapter on South African medicinal plants.
- My **friends**, who did not get upset with me when I could not visit. They encouraged me, supported me and they are still my friends.
- **Mrs. S. van Biljon**, who did the formatting of this thesis several times in a very professional way to deliver a tidy product.
- **Dr. M.E. Nelson**, the language practitioner who did all the editing with so much care.
- **Personnel of the Ferdinand Postma, Theological and Science libraries**, for all their help and support.
- My **colleagues** at work, who understood when I did not focus every morning, because of a minimum amount of sleep the night before.
- **Frank Julyan** for all his love and support.

INTRODUCTORY REMARKS

1.
STYLE

All the Roman numbers are translated back to the Arabic style. This was done to make the end product easier to read, and in order to maintain a consistent style throughout.

2.
TRANSLATIONS

Throughout the study the following translations were used. It is mentioned after the translation if someone else's translation is used.

Pliny, *Historiae Naturalis*:	H. Rackham Volume 4
	W.H.S Jones Volumes 5 - 8
Celsus, *De medicina*:	W.G. Spencer Volumes 1 - 3
Dioscorides, *De medica materia*:	L.Y. Beck
Theophrastus, *Historiae Plantarum*:	A. Hort
De causis plantarum:	B. Einarson and G.K.K. Link

3.
ANCIENT AND MODERN MEASUREMENTS AND DRY VOLUMES:

Celsus gave a very neat description of weights and dosages and Spencer (1953:XV) also converted it into modern weights.

Dry measures:

LATIN QUANTITY	TRANSLATION	MODERN QUANTITY
Libra, pondus	Pound	336 g
Bes librae	Two thirds	224 g
Selibra	One half	168 g
Triens librae	One third	112 g
Quadrans librae	One quarter	84 g
Sextans librae	One sixth	56 g
Sesquiuncia librae	One eighth	42 g
Uncia librae	One twelfth	28 g
Denarius, drachma	One seventh of an *uncia librae*	4 g
Bes denarii	Two-thirds	2.66 g
Semi denarius	One half	2 g
Quicunx denarii	Five twelfths	1.66 g
Triens denarii	One third	1.33 g
Quadrans denarii	One quarter	1 g
Sextans denarii	One sixth	0.66 g
Uncia denarii	One twelfth	0.33 g
Scripulum	One twenty-fourth of an *uncia librae*	1.16 g
Obolus	One sixth of a *denarius*	0.66 g
Hemiobolium	Half of an *obolus*	0.33 g

Liquid measures:

LATIN QUANTITY	TRANSLATION	MODERN QUANTITY
Amphora		30 l
Sextarius		Half litre (500 mL)
Hemina sextarii		Quarter of a litre (250 mL)
Quadrans sextarii		One eighth of a litre (125 mL)
Acetabulum	Eighth of a *sextarius*	63 mL
Cyathus	Twelfth of a *sextarius*	42 mL

In the recipes of Celsus, he used several symbols, each meaning a specific quantity. Spencer (1953:XVI) also translated these as follows:

SYMBOL	LATIN NAME	LATIN QUANTITY
P	*Pondus*	
PS	*Selibra*	Half
P -	*Uncia librae*	Twelfth of a pound
P bes	*Bes librae*	Two thirds
P = = or P ZZ	*Triens librae*	One third
P = -	*Quadrans librae*	One quarter
P ≃ or P Z	*Sextans librae*	One sixth
* followed by a numeral or H or X	One *denarius* or more	
P * - or P * ~	*Uncia denarii*	One twelfth of a *denarius*
P * S	*Semi-denarius*	One half
P * = = or P * ZZ	*Triens denarii*	One third
P * = -	*Quadrans denarii*	One quarter
P * = or P * Z	*Sextans denarii*	One sixth (one *obolus*)
P * = = -	*Quicunx denarii*	Five twelfths
S followed by a numeral		One *sextarius*
S without any numeral	*Semi*	One half

The Greeks also had their own weights and measure system. Beck (2002:xii) translates it as follows (after Berendes).

Dry volumes:

NAME	WEIGHT
Ceration	0.189 g
Thermos	0.378 g
Obol	0.568 g
Dichalcon = 2/3 obol	0.379 g
Cyamos Aigyptios	0.852 g
Gramma	1.137 g
Triobolon	1.794 g
Drachme	3.411 g
Holce	3.411 g
Caryon Ponticon	3.40 g
Caryon basilikon	13.644 g
Oungia	27.288 g
Xestes	54.58 g
Tetarton	81.86 g
Litra	327.45 g
Mna, Minai (pl.)	436.6 g

Liquid measures:

NAME	VOLUME
Cheme	0.0114 l
Cochlarion	0.012 l
Cyathos	0.0456 l
Mystron	0.068 l
Oxybaphon	0.0684 l
Tetarton	0.137 l
Cotyle	0.274 l
Xestes	0.547 l
Choinix	1.094 l
Chous	3.282 l
Ourna	13.130 l
Amphoreus	26.260 l
Ceramion	26.260 l
Metretes	39.360 l

In Turner's *Daily drug use* (2006:07), one can also find the modern dosages, weights and measures required to administer medication correctly to the patient.

DOSAGE	QUANTITY
1 drop	0.05 mL
1 teaspoon	5 mL
1 dessertspoon	10 mL
1 tablespoon	15 mL
1 wine glass	60 mL
1 tea cup	120 mL
1 tumbler	240 mL
1 c.cm	1 mL

ABSTRACT

Ancient medicine is a fast-growing field of research at international level, but since successful research implies both medical (or pharmaceutical) knowledge and the ability to read Latin and Greek, only one classicist in South Africa has published on the topic in co-operation with a medical doctor.

Although the professional and scholarly literature on ancient Greek and Roman medicine has proliferated in the last few decades, few studies have appeared that focus on narcotics and analgesics, their effects as observed and recorded by physicians, pharmacologists, and medical botanists, and an evaluation according to modern pharmacology or phytochemistry.[1]

The study is especially topical in the light of the modern-day search for herbal medicines and the renewed interest in South African ethnobotanical traditions (e.g. Afrikaner, Zulu, Swazi) as opposed to chemically prepared narcotics.

Phytochemical properties of crude drugs have predictable physiological effects in the living human organism. Therefore, presuming that humans have not changed except incrementally in their physiological chemistry over the short span of two millennia, one can likewise document the effects of narcotics and analgesics in Graeco-Roman pharmacology, provided that the botanical sources and their manufactured forms are carefully identified. A secondary assumption is that ancient plants also carried phytochemical properties generally identical to modern ones, so that the descriptive nomenclatures of modern botany and phytochemistry reveal multiple pharmacological principles and their actions in ancient drugs, as well as their potentially undesirable side effects.

[1] One of the exceptions is the 1995 "The Opium Poppy in Hellenistic and Roman Medicine" by Prof. John Scarborough (in Roy Porter and Mikuláš Teich, eds., Drugs and Narcotics in History [Cambridge and New York: Cambridge University Press]).

OPSOMMING

Antieke geneeskunde is 'n vinnig-groeiende navorsingsveld, veral op internasionale vlak. Aangesien suksesvolle navorsing sowel mediese kennis as 'n kennis van klassieke tale vereis, is daar tans in Suid Afrika slegs een klassikus wat in samewerking met 'n mediese dokter sulke narvorsing doen en artikels skryf.

Daar is heelwat akademiese literatuur op internasionale vlak oor antieke Griekse en Romeinse geneeskunde, maar min studies bestaan wat fokus op narkotiese middels en pynstillers; watter effekte dit op die liggaam het, soos dit deur dokters, farmakoloë en botanici aangeteken word; en 'n evaluering bied van die bewerings in die antieke geskrifte op grond van huidige fitochemiese en farmakologiese analises.[2]

Hierdie studie is veral gepas, gesien in die lig van moderne navorsing na kruie-medikasie en die hernude belangstelling in die Suid Afrikaanse etnobotaniese tradisies van bv. die Afrikaner, Zulu en Sotho, in teenstelling met chemies-geformuleerde narkotika.

Fitochemiese eienskappe van onbewerkte geneesmiddels het voorspelbare fisiologiese effekte in die menslike liggaam. Dus, indien die aanname gemaak kan word dat mense nie veel verander het in die loop van twee millennia nie, kan die effekte van narkotika en analgetika in die Grieks-Romeinse farmakologie gedokumenteer word, indien die botaniese geneesmiddels en die verwerkte toedieningsvorms suksesvol geïdentifiseer kan word. 'n Tweede aanname is dat die antieke plante dieselfde fitochemiese eienskappe as hul moderne eweknieë het en dat die beskrywende nomenklatuur van moderne plantkunde en fitochemie, farmakologiese beginsels en eienskappe, sowel as die effekte en potensiële newe-effekte van die antieke plante kan beskryf.

[2] Een enkele uitsondering is die 1995 artikel van Prof. John Scarborough ("The Opium Poppy in Hellenistic and Roman Medicine" (in Roy Porter and Mikuláš Teich, eds., *Drugs and Narcotics in History* [Cambridge and New York: Cambridge University Press]).

INDEX

CHAPTER 1
INTRODUCTION

Ancient medicine is a fast-growing field of research at international level, but since successful research implies both medical (or pharmaceutical) knowledge and the ability to read Latin and Greek, only one classicist in South Africa has published on the topic in co-operation with a medical doctor.[3]

Although the professional and scholarly literature on ancient Greek and Roman medicine has proliferated in the academic world in the last few decades, few studies have appeared that focus on ancient narcotics and analgesics, on their effects as observed and recorded by physicians, pharmacologists, and medical botanists and very few have attempted a comparison with modern pharmacology or phyto-chemistry.[4]

Natural medicine was the only form of medication known in antiquity, a science which is again becoming increasingly popular in the 21st century. The adverse side effects of chemically prepared medicines have led to a renewed interest in preparations obtained from natural sources and in herbal medicines.[5]

1.1 ANCIENT ANAESTHETICS

The ancients employed several methods to relieve surgical pain. Physical methods to achieve analgesia, such as packing a limb in ice or making it ischemic with a tourniquet, were occasionally used (Kennedy *et al.* 1990:268). Unconsciousness induced by a blow to the head or strangulation provided relief from pain, although at a high cost. However, the most common method used to achieve a relatively quiet

---

3 Prof. L. Cilliers, head of Classical Languages at the University of the Free State, in collaboration with Prof. F.P. Retief (retired dean of the medical school of the University of the Free State).

4 One of the exceptions is Scarborough 1995.

5 The World Health Organization (WHO) (1991:17) defines herbal medicines as follows: "Finished, labeled medicinal products that contain as active ingredients aerial or underground part or parts of plants, or other plant material, or combinations thereof, whether in crude state or as plant preparations. Plant material includes juices, gums, fatty oils, essential oils, and any other substances of this nature. Herbal medicines may contain excipients in addition to the active ingredients. Medicines containing plant material combined with chemically defined active substances, including chemically defined, isolated constituents of plants, are not considered to be herbal medicines".

surgical field was simple restraint of the patient by force. It is no wonder that surgery was looked upon as a last resort (Kennedy *et al.* 1990:269).

A less violent form of sedation, was the use of ancient narcotics. According to Reisine *et al* (1996:521), the term narcotic was derived from the Greek word for "stupor" (*narke*). It referred to any drug that induced sleep, but later became associated with strong opiate analgesics. Opiates are drugs derived from opium, but mandrake (*Mandragora officinarum)* and henbane (*Hyoscyamus niger*) were also considered to be analgesics according to Hippocrates' aphorism: "moderate stupor dissolves pain".[6] Galen, the most influential of the ancient physicians, born in 129 AD used all of these sedative drugs as well as hellebore (*Cicuta minor*) in the treatment of psychopathological states, especially in depressed or agitated patients (Siegel 1973:276).

Thorough research of the ancient texts revealed the common use in ancient medicine of three more plants with soporific and analgesic effects: datura (*Datura stramonium*), hemlock (*Conium maculatum*), and withania (*Withania somniferum*). Most of these sedative plants are members of a large botanical family, the *Solanaceae*.[7] These plants were employed not only as narcotics but also as anodynes.

The extracts from the opium poppy, *Papaver somniferum*, (family *Papaveraceae*), as well as decoctions from datura, henbane, hemlock and mandrake were used (either alone or in combinations) to dull the pain of surgery in ancient times. These extracts were used in combination with other plants with sedative powers. The seeds, leaves, and decoctions of the roots, flowers and stems of the other narcotic plants were added to create a formula, or recipe which produced generalised anaesthesia.

1.2 ANCIENT BELIEFS ABOUT HUMAN PHYSIOLOGY

A brief explanation of Hippocrates' (460 - 377 BC) basic theory about the human constitution is necessary to put into perspective the ancient thought on sleep, pain and the working of narcotics.

---

6 *narke metrie odynes lytike* (Kuehn. Vol. 17a p 904).

7 The ancient texts also refer to other plants with similar properties such as lettuce (*Lactuca scariola* L.), belladonna (*Atropa belladonna* L.) and cannabis (*Cannabis sativa* L.) etc., which will be discussed in the glossary.

Hippocrates conceived the theory of the four bodily humours, blood, phlegm, black bile and yellow bile in his *Corpus Hippocraticus*. These humours correspond to four qualities: warmth, cold, dryness and moisture (Pikoulis *et al.* 2004:427). Thus yellow bile was thought of as hot and dry. Its opposite, phlegm (the mucus of colds), was cold and moist. Black bile was cold and dry, while its opposite, blood, was hot and moist (Gill 1999:2). For a patient to be healthy, all the bodily systems needed to be in balance (*eukrasia*). Any disturbance of the balance (*dyskrasia*) between the four qualities would inevitably lead to sickness. (Luce 2001:201). According to Gill (1999:3), if it was a fever - a hot, dry disease - the culprit was yellow bile. So, the doctor would try to increase its opposite, phlegm, by prescribing cold baths. If the opposite situation prevailed (as in a cold), where there were obvious symptoms of excess phlegm production, the regimen would be to bundle up in bed and drink wine. If this did not work the treatment would resort to drugs, often hellebore, a potent poison that would cause vomiting and diarrhoea, an indication that the imbalanced humour was eliminated (Gill 1999:3).

Hippocrates also equated an imbalance of the four universal elements (earth, water, fire and air) to one's health. Too much earth made one melancholic; too much air, sanguine; too much fire, choleric; and too much water, phlegmatic.

The following table summarises Hippocrates' theory:

Bodily humours	Four seasons	Universal elements	Effect	Quality	Charac-teristic	Organs involved
Blood	Spring	Air	Sanguine	Hot and moist	Courageous, hopeful, amorous	Liver
Phlegm	Winter	Water	Phlegmatic	Cold and moist	Calm, unemotional	Brain and lungs
Yellow Bile	Summer	Fire	Choleric	Hot and dry	Bad-tempered, easily angered	Gallbladder
Black bile	Autumn	Earth	Melancholic	Cold and dry	Irritable, sleepless, despondent	Spleen

(Gill 1999:2)

With reference to Galen, Siegel (1973:257) gives the following description of ancient anaesthesia:

"Drugs which seemed to serve as refrigerants (cooling effect) of the body appeared to reduce brain function. Galen wrote that *carus*[8], *lethargus*[9], *narke*[10] and *coma*[11] could be produced by poisoning with mandragora, papaver, hyoscyamus and hemlock in larger than curative doses, as they can be seen as refrigerants".[12]

Today we know that sleep is an active process and not just the absence of wakefulness. The level of activity in the brain is not reduced and the oxygen uptake is even increased by the brain (Sherwood 2001:158). The sleep-wake cycle, as well as the stages of sleep is due to the interplay of three different neural systems in the brain stem (Sherwood 2001:161).

Galen, however, related sleep to a maldistribution of heat in the organism or to a decrease of the innate heat from fatigue. He argued that ingestion of an excessive

---

8 *Carus* and *coma* are synonyms (Siegel 1973:257).
9 *Lethargus* is the Latin word for "drowsy" (Lewis *et al.* 1975:1052).
10 *Narke* was the stupor induced by contact with the electric fish (Siegel 1973:257).
11 *Koimao*, "to sleep" (Siegel 1973:257).
12 See also Kuehn's translation of Galen. Vol. 7 p 142 -143 about Anaesthesia.

amount of food or drink decreases the dryness of the body by retention of moisture which in turn causes sleep.[13]

The English translation of "Medical Definitions", a spurious treatise included in the Kuehn edition of Galen's works describes the cause of sleep as follows: "What brings on sleep? It is the useful material which is brought from the stomach to the brain and which is more moist and moderately warm" [14] (Siegel 1973:145).

Galen also believed that wakefulness depended on the state of the brain. A normal sleeping pattern would indicate a warm and dry brain while insomnia was ascribed to dryness and warmth of the *sensus communis*. Aristotle thought that drugs such as mandrake and opium had a pharmacological effect on the body similar to the way in which food influenced the metabolism, but according to Galen these drugs had a soporific effect because they removed basic qualities from the organs or transferred them from one organ to another (Siegel 1973:145).

Galen thought that when the body is in a state of deep sleep, it does not feel or move (*karodesi pathesin*), it only maintains the respiration which is the result of the movement of the thoracical muscles (Siegel 1976:97). He uses the term "paralysis" (παραλησισ) to refer mainly to the loss of movement where as "anaesthesia" (insensibility) (αμαεστεσια) indicates a loss of sensation in the affected part (Siegel 1976:102).

1.3 THE ANCIENT AUTHORS USED IN THIS STUDY

Several ancient literary and medical treatises contain references to sedation and pain relief during surgery. These texts discuss not only medical conditions, but also give pharmaceutical advice and provide recipes for treatment of different illnesses. The biographies of each of these authors indicate that only Galen and Dioscorides had any first-hand, scientific knowledge of medicine.

Texts of the following authors are especially relevant to this study:

Theophrastus of Eresus (*ca.* 370 – 285 BC) in Lesbos was not only a student, but also a collaborator and successor of Aristotle (384 – 322 BC). Theophrastus started

---

13 Kuehn Vol. 9 (1964:140).

14 Kuehn Vol. 19 (1964:381).

his research especially in botany and wrote down descriptions of medicinal plants (*dynamis*) commonly assumed by his folk-medical informants, the semi-professional rootcutters (*rhizotomoi*). According to Einarson (1976:ix), Theophrastus' work is no textbook, but pure research. Theophrastus reflects on ordinary rituals and folk-beliefs and classifies and evaluates single plant remedies (Hammond *et al.* 1970:1058). After Aristotle, Theophrastus was seen as the most influential scholar and his works continued to be influential until the first centuries of the Christian era (Hammond *et al.* 1970:1059).

Illustrative of the ancient employment of soporifics are accounts in the writings of **Cornelius Celsus** (*fl. ca.* AD 37), whose *De medicina* collects numerous recipes from the previous three centuries. Spencer questions the assumption that Celsus was a practising physician since not much of Celsus' life is known (1935:vii). However, based on the fact that he wrote with the authority of an experienced physician, one can assume that Celsus was an educated medical practitioner. He expressed his opinions on treatments or symptoms, he wrote about patients he saw, he even made night calls (Spencer 1935:xi) and was well acquainted with the leading medical authors (Spencer 1935:xii). Although he also wrote on agriculture, military science, rhetoric, philosophy and jurisprudence, only the medical books have been preserved. His books on medicine are important for the reconstruction of Hellenistic doctrines and it became the model of medical Renaissance writing (Hammond *et al.* 1970:218).

Latin texts include the multifaceted *Historiae Naturalis* by Pliny the Elder (23 - 79 AD). He was born in Como, from a family which belonged to the equestrian class. As a result, Pliny was able to study. Before AD 35 (Plin. *H.N.* 37.81), Pliny's father took him to Rome, where he was educated. He did his military service in Germania under the command of his father's friend, the poet and military commander, Publius Pomponius Secundus, who inspired him with a lifelong love of learning. In Rome he studied botany in the *topiarius* (garden) of the aged Antonius Castor. Under the influence of Seneca the Younger he became a keen student of philosophy and rhetoric, and began practicing as an advocate. He also devoted much of his time to writing on the comparatively safe subjects of grammar and rhetoric.

The *Historiae Naturalis* consists of 37 books and was dedicated to Vespasian in AD 77, although it was published posthumously (Hammond *et al.* 1970:845). Although

frequently compressed, truncated, and multilayered in its composition, the *Historiae Naturalis* is often a valuable assembly of pharmaceutical formulas and recipes gathered from Greek and Latin traditions, as well as agricultural and medical folklore.

Pliny's text often contains second-hand information since he draws liberally from other sources. He states in his preface that the *Historiae Naturalis* contains 20 000 important facts obtained from 100 principal authors. Sometimes he gets stuck on the description and identification of plants and this confirms the impression that not only Pliny's own research, but also that of his sources have been included. The text certainly contains copies of previous descriptions. Since Pliny's text often corresponds to that of Dioscorides (§5.4), it is likely that they used the same common source - Sextius Niger (Beck 2005:xv). The *Historiae Naturalis* therefore portrays many general truths about ancient narcotics and cannot be disregarded as a source.

Pliny the Elder died on August 25th, AD 79 during the famed eruption of Mount Vesuvius that also destroyed the cities of Pompeii and Herculaneum.

The most important text on Roman pharmacology is **Dioscorides' of Anazarbus** (*ca.* 40 - c. 90 AD) masterful *De Materia Medica* in five books, likely set down in about AD 70. According to Beck (2005:xiii), he can be seen as a master pharmacologist and his work contains references to an amazing collection of drugs. He studied herbal pharmacology at Tarsus (Beck (2005:xv). As a well-travelled physician Dioscorides may have served as a civilian doctor in an eastern region before he recorded his knowledge in his *De Materia Medica* (Hammond *et al.* 1970:353). His detailed descriptions of preparations include the expected benefits and toxic side effects of the plants. After repeated observations and recording of effects on patients, Dioscorides was able to refute the wide ranged condemnation of opium by the famous Ptolemaic physician and anatomist, Erasistratus of Ceos (*fl.* 260 BC in Alexandria). He insisted that a physician not only needed to know the sources of medical botany, but he also had to be an expert on herbal lore as derived from personal knowledge and experience of the use and effects of different plants (Beck 2005:xiv). The complete *De Materia Medica* is a compilation of more than 600 individual drugs which were used in more than 200 recipes and formulas (Beck 2005:xviii),

Arguably the most influential physician in Western medical history, **Galen of Pergamon** (AD 129 - after 210) has left us a huge oeuvre encompassing not only

comparative anatomy, physiology, pharmacology, therapeutics, and surgery, but also works on practical health, dietetics, medical terms, linguistics, gymnastics and professional athletics, and a series of detailed commentaries on earlier medical writings in Greek that Galen deemed Hippocratic. Galen had a spectacular career, from gladiator-physician in Asia Minor to court physician in Rome during the reign of Marcus Aurelius (Hammond *et al.* 1970:454).

There are also occasional referenceS made to the following minor authors as Greek, Roman and Byzantine pharmacologists and physicians: **Oribasius** (AD 325 – 400), **Aetius of Amida** (AD 500 – 550), and others like **Flavius Josephus** (AD 37 – 101), **Frontinus** (AD 30 - 104), **Plato** (429 - 347 BC), and **Apuleius** (*ca.* AD 123).

1.4 RELEVANCE OF THIS STUDY

Ancient medicine is a fast-growing field of research at international level, but since successful research implies both medical (or pharmaceutical) knowledge and the ability to read Latin and Greek, only one classicist in South Africa has published on the topic in co-operation with a medical doctor.

Although the professional and scholarly literature on ancient Greek and Roman medicine has proliferated in the academic world in the last few decades, few studies have appeared that focus on ancient narcotics and analgesics, on their effects as observed and recorded by physicians, pharmacologists, and medical botanists and very few have attempted a comparison with modern pharmacology or phytochemistry.

Natural medicine was the only form of medication known in antiquity, a science which is again becoming increasingly popular in the 21st century. The adverse side effects of chemically prepared medicines have led to a renewed interest in preparations obtained from natural sources and in herbal medicines. This recent trend renders this study of ancient narcotics, derived exclusively from plants, all the more relevant. The study is also especially topical in the light of the renewed interest in South African ethnobotanical traditions (e.g. Afrikaner, Zulu, Swazi) in contrast to chemically prepared narcotics.

1.5 AIMS AND OBJECTIVES

One can state the central problem of this thesis as follows: What (in modern terms) are the phytochemical and pharmaceutical properties of mandrake, poppy, datura hyoscyamus, hemlock, hellebore and withania and their compounds as described in ancient texts? The thesis also attempts to answer the following related questions: Can one provide modern pharmaceutical equivalents for mandrake, poppy, datura and hyoscyamus? How does the practice of ethnobotanical medicine in South Africa compare to Greek and Roman medical botany, and does the reexamination of ancient recipes that include botanical sources for drugs, have practical relevance for modern pharmacy?

The main purpose of this study is to determine whether ancient healers used their medication for the correct indications and, if they did, why did it work? The studies that plant pharmacologists and scientists have done on medicinal plants, together with their chemical constituents, active ingredients and pharmacological actions, make it possible for the modern scholar to evaluate the ancients' use of drugs and to determine their efficacy.

1.6 METHODOLOGY

The preparations which will be discussed in this thesis can be called *hypnopoieo*, meaning "inducing sleep" or "those that bring sleep" (*hypnos* (sleep) and *poieo* (to bring about) (Ramoutsaki *et al.* 2002:44). They were, however, employed not only to create a deep sleep in order to render the patient insensible to surgical pain, but also to relieve pain caused by ulcers, ear and eye inflammations, rheumatism, cough, fever, labour pains and for other indications

Chapters 2-8 are structured as follows:

* Selection of ancient medical texts containing references to poppy, mandrake, datura, hemlock, hyoscyamus, hellebore and withania respectively with the aid of any detailed indices or concordances available;
* translation of Greek and Latin texts into English to make the following information accessible (also to non-classicists): the source of supply, pharmacological technologies applied to these drugs and their purported effects according to the ancient texts;

* annotating these texts by means of research, consultation of controlled laboratory studies, professional periodicals in pharmacology, economic botany, ethnopharmacology as well as specialised references, encyclopedias and sources on the internet (where verifiable), with regard to: determination of the pharmacology and phytochemistry of the plants mentioned in the nomenclatures and descriptive terminologies of the 21st century; documentation of the multi-ingredient compounds, containing these plants, that produced anaesthesia;

* description of the compounds in which they were present (ingredients, dosages, uses and effects) in the terminologies of modern phytochemistry and pharmacology;

* comparisons between the data in Greek and Latin texts with properties of compounds as determined in modern pharmaceutical practice; analysis of findings in all facets of the research and reaching conclusions regarding the efficacy of the plants and the compounds in which they were present,

* a comparison in terms of current phytochemistry and medicinal pharmacy;

* comparison of the rates of efficacy, where such can be determined in the ancient texts; modern equivalents for the ancient narcotics.

The works of Galen are not included in this study for two reasons. Firstly no reliable translation could be found in South Africa and in the second place the scope of this thesis precludes a detailed analysis of this voluminous text. The supervisors of the study agreed that the texts chosen for the analysis provide a good general survey of ancient narcotics.

Chapter 9 contains documentation and analyses of South African plants which produce narcotic and/or soporific effects in order to establish possible equivalents for the plants which have been discussed in the previous chapters.

In Chapter 10 the practice of ethnobotanical medicine used for pain or sleep in the recipes as documented by the ancient authors is compared to their modern equivalents. It leads to some conclusions, based on the research, regarding the practical relevance of ancient medicinal recipes to modern pharmacy. This makes it

possible to draw a conclusion regarding the recipes, whether it would be valid for its specific purpose or not.

CHAPTER 2
PAPAVER SOMNIFERUM L.

English - Opium poppy

Afrikaans – Papawer

French – *Pavot somnifère*

German – *Schlafmohn*

Italian – *Pivot officinal; Papavero domestico*

Commercial products - Turkish opium, Indian opium, Persian opium, Chinese opium, Egyptian opium

---

Booth gives the following description of opium: "The first substance of the alkaloid group, is extracted from poppies, popular name of *Papaver somniferum*, one of several species of the Papaveraceae family, characterized by solitary leaves and capsulated fruits. *Papaver somniferum* has probably evolved from a wild Asian species, or from a species called *Papaver setegirum*, which grew around the Mediterranean sea" (Booth 1998:27).

The opium poppy, *Papaver somniferum* L., belongs to the *Papaveraceae* family. The plant provides a narcotic that induces sleep, a sleep so heavy that the person becomes insensible. Its compounds are used in medicine as analgesic, antispasmodic, hypnotic, narcotic, sedative, and as respiratory depressants (Van Wyk *et al.* 2004:225).

Many of our medical texts from Hellenistic and Roman times record the use of the opium poppy latex in the alleviation of pain. Illustrative are accounts in the writings of Cornelius Celsus, whose works collect numerous recipes from the previous three centuries which incorporate the common employment of poppy for pain, although Celsus' sources occasionally focus on weaker species, including the corn poppy. By Celsus' day, the latex was widely distributed as sun-dried lozenges - to be melted as needed - generally designated as *lacrimae papaveris* ("the tears of the poppy") (Tallmadge 1946:516).

The *Historiae Naturalis* of Pliny often provides a valuable assembly of pharmaceutical formulas and recipes. Pliny and his sources make it abundantly clear that the opium poppy was available throughout the Roman Empire in the first century, and therefore it was available to all strata of society, from the ruling aristocracy to the poorest of the rural inhabitants.

Book 4.64 of Dioscorides' *Materia Medica* is an extended summary of the properties and uses of the opium poppy, revealing incidentally the long history of opium poppy in Greco-Roman medicine. Dioscorides says that opium is relatively safe, as long as it is employed with proper cautions.

Among Galen's lengthy collections of pharmaceutical recipes, two focus on toxicology and the manufacture of multi-ingredient prophylactics and counter-measures, and it is in the *Antidotes* that Galen relates how and when Marcus Aurelius took tiny quantities of the opium poppy latex well mixed with at least 59 other ingredients.[15] [16]

The opium "juice" or latex is an organic substance with alkaline properties, now identified as an alkaloid. Sertürner renamed it and called it *morphium* after the Greek god of dreams (Morpheus) and in 1816 / 1817 he performed a detailed chemical and pharmacological analysis of this drug (Macht 1915:466). He was the first researcher to laboriously extract the alkaloid.

2.1 MORPHOLOGY

Dioscorides describes the plant as follows:

"The opium poppy: there is one kind that is cultivated and that is grown in gardens; its seed is baked into bread to use in a health-inducing diet; they also use it with honey instead of sesame; it is called *thylacitis*, having its little head oblong and its seed white. And there is another kind that is wild, having a capsule that hangs down, and black seed; this one is also called *pithitis*, but some call even this one *rhoias*, because the juice flows from this one. A third kind is wilder, smaller, and more medicinal than these, having the capsule oblong" (4.64.1).

---

15 See also Cilliers, L and Retief, F.P. Marcus Aurelius se siektegeskiedenis en dood: was hy 'n opiumverslaafde?". Tydskrif vir Geesteswetenskappe. Maart 2007:47:1 (56-65).

16 Marcus Aurelius was not an opium addict (Scarborough 1995:17-18), in spite of earlier interpretations of some pertinent passages in Galen's Antidotes (Africa 1961:98).

Pliny also describes the irregular raven scratchings of the plant on the stem as it is seen on poppy (*H.N.* 13.98).

Theophrastus describes the different kinds of poppy found:

"There are several kinds of wild poppy: the one called the horned poppy is black; the leaf of this is like that of the black mullein, but it is not so black; the stem grows about a cubit high, the root is stout and shallow, the fruit is twisted like a little horn: it is gathered at the time of wheat harvest. It has the property of purging the belly, and the leaf is used for removing ulcers on sheep's eyes. It grows by the sea, wherever there is rocky ground" (*H.P.* 9.12.3).

"The species known as[17] *rhoias*, is similar to wild chicory, and is edible. It produces a red flower, and a head as large as a man's finger-nail. It is gathered before the barley-harvest, when it is still somewhat green" (*H.P.* 9.12.4).

"Another kind of poppy is called *Herakleia*: it has a leaf like soap-wort, with which linen is bleached: the root is slender and does not run deep, and the fruit is white". (*H.P.* 9.15.5).

Pliny writes that the cultivated poppy is larger than the wild variety and the heads are round, while those of the wild are long and small, though for all purposes more effective (*H.N.* 20.202).

2.1.1 THE JUICE (POPPY LATEX)

According to Theophrastus, "the distinct in taste and shape (of the capsule), form a whole which are tolerably evident to all" (*H.P.* 1.12.1).

Dioscorides gives a detailed description of poppy juice:

"Best is the latex (*opos*) which is thick and heavy and soporific to the smell, bitter to the taste, easily diluted in water, smooth, white, neither rough nor full of lumps nor congealing as one passes it through [a sieve] as is [characteristic] of wax; set out in the sun and spreading, and being kindled by a lamp, it does not have a darkly coloured flame, retaining indeed its own particular odour. But they counterfeit it by mixing the juice of the horned poppy (*glaukion*) or acacia-gum (*kommi*) or the juice of

---

[17] See Plin. *H.N.* 14.167 – 169; Diosc. 4.64.1.

the wild lettuce; that which is made from the juice of the horned poppy is like saffron in the solution, and that made from the lettuce loses it odour and is rougher, and that made from the acacia-gum is weak and translucent" (4.64.5) [trans. Scarborough 1995:19].

Theophrastus adds that the juice is milky, "as that of the fig and poppy" (*H.P.* 1.12.2).

2.1.2 THE SEED

Theophrastus indeed knows that the little black seed of the poppy is found enclosed in a capsule: "in a vessel are those [seeds] of the poppy and plants of the poppy kind" (*H.P.* 1.11.2).

2.2 DISTRIBUTION AND HARVESTING

Pliny writes that the best poppy grows on dry soil and where the rainfall is slight (*H.N.* 20. 202). Theophrastus adds that it grows in cultivated fields and especially among barley. It has a red flower, and a head as large as a man's finger-nail. It is gathered before the barley-harvest, when it is still somewhat green. It purges downwards[18] (*H.P.* 9.12.4) and Theophrastus also notes that *Herakleia* grows in the country of the Arcadians (*H.P.* 9.15.5).

2.3 PROCESSING OF THE PLANT

Dioscorides describes how the poppy was processed to make troches[19] - a mildly acting form of this drug:

"One ought to make it [poppy] into lozenges - pounding them in a mortar while they are still green - and drying them to lay them up in storage, and thus employ it. The poppy capsules are to be boiled in water down to half the original volume, and then boiled again with honey until 'the moisture should condense out' " (4.64.2)[trans. Scarborough 1995:8].

"This process produces a syrup, which could be hardened into tablets, stored and remelted to make an anodyne lozenge for coughs, rheums of the trachea, and for conditions relating to the abdomen" (Diosc. 4.64.2).

---

[18] In medicinal terms this has laxative effects.
[19] Lozenges.

"And it is not out of place to sketch out also the way in which they collect the juice [latex]; some, on the one hand, after beating the capsules with the leaves, squeeze it out through a press and pounding it in a mortar, they fashion lozenges; this as such is called *meconium,* being less efficacious than the juice [la8tex]. But when extracting the latex, one ought to draw in the outline [i.e. cut] the 'little star' with a knife after the dew has evaporated, so that the incision does not perforate onto the inside of the capsule, and to cut in the form the top straight lines on the sides of the capsules, and to attach off the tear that comes out into a sea-mussel (*myax*) shell, and again to come back to this capsule after a short time; for there is to be found another congealed tear, and also another is to be found on the following day; one ought to pound it in a mortar and lay it up for storage when made into lozenges; and indeed in cutting the capsule for the latex one ought to stand back so that the latex is not attached to one's clothing" (Diosc. 4.64.7) [trans. Scarborough 1995:16].

Pliny tells us that when the heads themselves and the leaves are boiled down, the juice is called meconium, which is much weaker than opium. The main test of opium is its smell and that of pure opium is unbearable; the next best test is to put it in a lamp, where it should burn with a bright, clear flame and give off a smell only when it has gone out; adulterated opium does not behave in this fashion. Adulterated opium is also harder to light, and goes out continually. Poor opium floats on water, as a light cloud, while impure poppy gathers into blisters. Pliny regards the fact that pure opium is detected by the summer sun as especially noteworthy. He tells us that pure opium sweats and melts until it becomes like freshly gathered juice. Mnesides[20] thought that opium was best kept [stored] when the seed of hyoscyamus was added, others put hyoscyamus between the beans (*H.N.* 20.203).

Other kinds of processing are also described by Dioscorides: Scarborough (1995:16) translates it as follows:

"And some people are attended by so much madness so as to mix animal fat (*stear*) with it. And it is roasted in a new earthenware pot to make the eye-salves (*la ophthalmika*) until it should appear soft and more tawny-orange" (4.64.5-6).

---

[20] Likely the same as the Mnesidimos mentioned in Diosc. 4.64; Scarborough (1995:19) Mnesidimos was an unknown Hellenistic physician, who appears to have been a noted authority on the opium poppy.

2.4 ADMINISTRATION OF THE PLANT

Celsus does not recommend the use of poppy in the form of pills:

"Catapotia quoque multa sunt, variisque de causis fiunt. Anodyna vocant, quae somno dolorem levant; quibus uti, nisi nimia necessitas urget, alienum est: sunt enim ex vehementibus medicamentis et stomacho alienis" (5.25).

"Pills are also numerous, and are made for various purposes. Those which relieve pain through sleep are called anodynes; unless there is overwhelming necessity, it is improper to use them; for they are composed of medicaments which are very active and alien to the stomach".

Dioscorides prescribes topical application of poppy. The seed of the black poppy, ground up, is plastered on with water on the forehead and the temples of insomniacs (4.64.3). It can also be consumed: the leaves and capsules, boiled in water and taken orally for insomnia (4.64.2). The decoction was also used to foment the face and head.[21]

Inserted into the anus as a suppository, it is soporific (Diosc. 4.64.4) and Dioscorides continues to say that the best juice is thick and heavy and it induces sleep when smelled (4.64.5). Lozenges are made of the thick juice which has been dried in the shade.[22]

Pliny also gives a full description of how the poppy was administered. Not only the calyx, but also the seeds and capsules were sometimes pounded and administered in either wine or milk to induce sleep: "Usually the poppy-heads and the leaves are boiled in wine until the juice, meconium, is obtained. Even though it is not as strong as opium, it still induces sleep. The head is usually fomented[23] with the same decoction to hasten the sleep inducement (*H.N.* 20.198-204).

---

21 See also:
"...*Plurimi, decoctis papaveris corticibus, ex ea aqua spongia os et caput subinde fovent*" (Cels. 3.18.13).
"Many foment the face and head at intervals with a sponge dipped in a decoction of poppy heads".

22 "*Papaveris vero largus densatur et in pastillos tritus in umbra siccatur...Opium vocant*" (Plin. *H.N.* 20.198).
"Poppy juice however being copious thickens, and squeezed into lozenges is dried in the shade;
It is called opium".
See also Diosc. 4.64.5 § 2.2.1.

23 See also Cels. 3.18.13 and Plin. *H.N.* 20.202.

2.5 MEDICINAL EFFECTS

2.5.1 SLEEP

Dioscorides describes the poppy's common property as cooling;[24] it is for this reason that a decoction of the leaves and capsules is drunk for insomnia (4.64.2), and according to Dioscorides, the seed of the black poppy, as well as the juice are soporific (4.64.3).[25]

According to the author Celsus, the Romans also knew that the ability of solanaceous plants to induce sleep was increased if they were combined with the juices of the opium poppy. It was a well-known fact that poppy is a sleep-inducing herb,[26] which, in large quantities, was used as narcotic.[27]

"Si nihili minus vigilant, quidam somnum moliuntur potui dando aquam, in qua papaver ...decota sint " (3.18.12).

"If in spite of this patients are wakeful, some endeavour to induce sleep by draughts of decoction of poppy".

Pliny also writes about the soporific and narcotic effects of the poppy. He and his sources knew which plants had more soporific effects than the others (H.N 20.198).

"Papaveris... non vi soporifera modo, verum, si copiosior hauriatur, etiam mortifera per somnos. Opium vocant" (H.N. 20.198).

"Poppy juice is not only a soporific, but if too large a dose be swallowed the sleep even ends in death. It is called opium".

Pliny mistakenly believed that not only the juice, but also the seed had narcotic properties. This probably results from the fact that Pliny uses secondary sources.[28]

"*Semine quoque eius trito in pastillos e lacte utuntur ad somnum*" (Plin. *H.N.* 20.201).

---

24 See Introduction

25 See also Diosc. 4.64.4-5

26 "*Somno vero aptum est papaver, lactuca, maximeque aestiva, cuius coliculus iam lacte repletus est, morum, porrus*" (Cels. 2.32).
"For producing sleep the following are good: poppy, lettuce and mostly the summer kinds in which the stalk is very milky, the mulberry (colìculus = collective noun for a lot of berries), the leek". See also Cels. 5.25 for sleep effects.

27 "*de papavere ...visque somnifera etiam sativo*" (Plin. *H.N.* 18.229).
"Also cultivated poppy is a powerful soporific".

28 See Introduction p.6

"The seed too pounded into lozenges with milk is used to induce sleep".

The seeds has no narcotic effect (see §2.7.2.1). Even Dioscorides (who obviously worked with the plant) knew that the seeds are used to make nourishing bread (4.64.1).

2.5.1.1 Recipe for sleep:

The following recipe of Celsus was used to induce sleep. The ancients superstitionally believed that a mixture that was prepared at night had a better effect than one that was prepared in the day.

"*Aliud ad idem: murrae P. * -; mandragorae suci P. * I; papaveris lacrimae P. * II; foliorum rosae, cicutae seminis, singulorum P. * III; acaciae P. * IIII; cummis P. * VIII. Et haec quidam interdiu: nocte vero, quo commodior quies veniat, non alienum est superinponere candidi panis interiorem partem ex vino subactam*" (6.6.1.H)[29].

"Another composition having the same efficacy is made up of: myrrh 0.33 grms., mandragora juice 4 grms.; poppy-tears 8 grms.; rose-leaves and hemlock seeds 12 grms. each; acacia 16 grms.; gum 32 grms. These applications are made by day; at night, in order better to assure sleep, it is not inappropriate to apply above the eye, the crumb of white bread soaked in wine".

ANALYSIS

INGREDIENT	AMOUNT
Myrrh	0.33 g
Mandragora juice	4 g
Poppy tears	8 g
Rose petals	12 g
Hemlock seeds	12 g
Acacia	16 g
Gum	32 g

The total quantity of ingredients in this recipe is 88.33g of which mandrake juice makes up 4%, poppy tears 9% and hemlock seeds 14%.

---

[29] John Scarborough thinks that Celsus likely culls the recipe from a circulating handbook (in Greek) - thus it would probably date to about 50 BC

2.5.2 GENERAL PAIN

There are several recipes for the treatment of general pain. Here follows a recipe which Celsus provides containing poppy to relieve any form of pain.

"*Sive autem capitis dolores sive ulcera sive lippitudo sive dentes...sive spiritus difficultas sive intestinorum tormenta sive inflammatio vulvae est, sive coxa sive iecur aut lienis aut latus torquet, sive vitio locorum aliqua prolabitur et ommutescit, occurit dolori per quietum eiusmodi catapotium: silis, acori, rutae silvestris seminis, singulorum P. * I; castorei, cinnamomi, singulorum P. * II; papaveris lacrimae, panacis radicis, mandragorae malorum acridorum, iunci rotundi floris, singulorum P. * II = -; piperis grana LVI. Haec per se contrita, rursus instillato subinde passo, simul omnia teruntur, donec crassitudo sordium fiat. Ex eo paululum aut devoratur, aut aqua diluiter et potui datur*" (5.25.3).

"*Quin etiam silvestris papaveris, cum iam ad excipiendam lacrimam maturum est, manipellus qui manu conprehendi potest, in vas demittitur, et superinfunditur aqua, quae id contegat, atque ita coquitur. Ubi iam bene manipellus is coctus est ibidem expressus proicitur; et cum eo umore passi par mensura miscetur, infervescitque, donec crassitudinem sordium habeat. Cum infrixit, catapotia ex eo fiunt ad nostrae fabae magnitudinem, habentque usum multiplicem. Nam et somnum faciunt vel per se adsumpta vel ex aqua data*" (5.25.4).

"But whether there is headache or ulceration or ophthalmia or toothache or difficulty in breathing or intestinal gripings or inflammation of the womb or pain in the hips or liver or spleen or ribs or, whether owing to genital trouble, a woman collapses speechless, a pill of the following kind counteracts pain by producing sleep: saxifrage, sweet flag, wild rue seed, 4 grms. each, castory and cinnamon 8 grms., poppy tears, panax root, dried mandrake apples, flowers of the round rush, 9 grms. each, and 56 peppercorns. These are first pounded separately, then rubbed up all together, whilst gradually adding raisin wine until the mixture is of the consistency of sordes.[30] A small quantity is either swallowed or dissolved in water and taken as a draught".

"Or take a good handful of wild poppy-heads when just ripe for collecting the juice and put into a vessel and boil with water sufficient to cover it. When this handful has

[30] *Sordes* = filth, uncleaness, dirt. Or impure matter collecting about the teeth, gums (O.E.D. Vol. 10 p. 441).

been well boiled there, after being squeezed out it is thrown away; and with its juice is mixed an equal quantity of raisin wine, and heated until of the consistency of sordes. When the mixture has cooled, pills are formed, the size of our beans; they are used in many ways. For they procure sleep whether taken as they are or in water".

ANALYSIS

INGREDIENT	AMOUNT
Saxifrage	4 g
Sweet flag	4 g
Wild rue seed	4 g
Castory	8 g
Cinnamon	8 g
Poppy tears.	9 g
Panax root	9 g
Dried mandrake apples	9 g
Flowers of the round rush	9 g
Peppercorns	56

The total quantity of ingredients in this recipe is 64g, without including the weight of the peppercorns. In terms of the other ingredients, poppy tears as well as the dried mandrake apples make up 14% each of the recipe.

2.5.2.1 Toothache

Celsus recommends the following treatment in the case of toothache.

"*...In dentium autem dolore, qui ipse quoque maximis tormentis adnumerari potest, vinum ex toto circumcidendum est...*" (6.8.9.1).

"*...Quod si gravior dolor est, utiliter et alvus ducitur, et calida cataplasmata super maxillas inponuntur, et ore umor calidus cum medicamentis aliquibus continetur, saepiusque mutatur. Cuius rei causa et quinquefolii radix in vino mixto coquitur, et hyoscyami radix vel in posca vel in vino, sic utpaulum his salis adiciatur et papaveris non nimium aridi cortices et mandragorae radix eodem modo. Sed in his tribus utique vitandum est, ne, quod haustum erit, devoretur*" (6.8.9.2).

"...*Quin etiam quaedam quasi cataplasmata in dentum ipsum inlinuntur*" ... "*Aut panacis, papaveris lacrimae, peucedani, uvae taminiae sine seminibus pares portiones conteruntur. Aut galbani partes tres, papaveris lacrimae pars quarta*" (6.8.9.3).

"...Now in the case of pain in the teeth, which by itself also can be counted among the greatest of torments, wine must be eliminated".

"...For more severe pain a clyster is useful, with a hot poultice upon the cheeks[31], and hot water containing certain medicaments held in the mouth and frequently changed. For this purpose cinquefoil root may be boiled in diluted wine, and hyoscyamus root either in vinegar and water, or in wine, with the addition of a little salt, also poppy-head skins not too dry and mandragora root in the same condition. But with these three remedies, the patient should carefully avoid swallowing the fluid in the mouth".

"...Moreover, some applications, like poultices, are smeared on the root itself".

"... Or equal quantities of all-heal, poppy-tears, sulphur wort, and black bryony berries without the seeds are pounded together. Or three parts of galbanum to one of poppy juice".

Heras'[32] recipe for pain relief is quoted by Celsus.

"*Si vero exesus est dens, festinare ad eximendum eum, nisi res coegit, non est necesse: sed tum omnibus fomentis, quae supra (3 seq.) posita sunt, adiciendae quaedam valentiores conpositiones sunt quae dolorem levant; qualis Herae est. Habet autem papaveris lacrimae P. * I; piperis P. * II; soreos P. * X; quae contrita galbano excipiuntur, idque circum datur* " (6.9.5).

"When a tooth decays, there is no hurry to extract it, unless it cannot be helped, but rather to the various applications described above, we must add more active compositions for the relief of pain, such as that of Heras. This has: poppy juice 4 grms.; pepper 8 grms.; sory 40 grms.; pounded, taken up in galbanum, and applied around the tooth" [trans. Spencer, Vol. 2 p. 248, slightly modified].

---

31 Scarborough (2008) translates *super maxillas* i.e. above the jaws.

32 Heras of Cappadocia fl. in Rome c. BC - AD 20. He investigated the properties of samples and became a widely used authority on drugs and compound medicine (Scarborough 1995:20).

ANALYSIS OF HERAS' RECIPE

INGREDIENT	AMOUNT
Poppy juice	4 g
Pepper	8 g
Sory	40 g

The recipe of Heras contains 7.7% poppy juice in relation to the whole recipe of 52g.

Analysis of the recipe as recorded by Celsus' third recipe

INGREDIENT	AMOUNT
Chamomile	4 g
Pepper	4 g
Elaterium	4 g
Broom	4 g
Scissile alum	8 g
Poppy juice	8 g
Black bryony berries	8 g
Crude sulphur	8 g
Bitumen	8 g
Laurel berries	8 g
Mustard	8 g

The total weight of this general recipe as remedy is 68g. The only narcotic present is the poppy juice, of which they added 8g [11.7%]. Menemachus' recipe (Cels. 6.9.5) has several ingredients of which mustard is the main ingredient. According to Watt (1962:336), the plant has emollient, sedative and even narcotic properties and the oil is externally used for rheumatic pains (Williamson 2003:307).

Since there is just a small amount of narcotic present in the recipe, one would assume that it was used to prevent infection and inflammation when the molar teeth was ready to appear in the jaw.

2.5.2.2 Earache

Soaked with unguent of roses, it is also good for headaches, but for earaches[33] it is good when instilled with unguent of almonds, saffron and myrrh (Diosc. 4.64.4).

According to Scarborough (1995:14), Dioscorides observes the reliable effects and benefits, especially if there is a chance of open sores or wounds in the external auditory meatus. Myrrh in solution is bacteriostatic, especially against gram-positive *Staphylococcus aureus*, the most typical bacteria in wounds. If saffron [which has microbe-reducing properties], is combined with the bacteriostatic myrrh, and poppy with its analgesic effects, one would consider this as a useful drug for earache.

As for the juice, Dioscorides adds that it, too, cools a great deal, dulls and dries, when an amount as small as a bitter vetch is consumed, it is analgesic (4.64.3).

2.5.2.3 Bladder pain

In a passage where he discusses constricting remedies, Celsus writes:

"*Idem faciunt etiam albae olivae, et nigrum papaver cum melle adsumptum, et cummis cum contrito semine apii liquatum et cum cyatho passi datum* " (4.27.1E).

"White olives also produce the same effect, also black poppy seeds, taken with honey, and liquid gum, mixed with pounded celery seeds, and given in a cupful of raisen wine".

2.5.2.4 Painful urination

Difficult and painful urination can be a great problem, which goes together with much pain, especially when infection is also involved. This is a disease which the ancients also experienced. Celsus gives a recipe which not only dulled the pain, but also inhibit the inflammation and infection.

"*Adversus urinae difficultatem piperis longi, castorei, murrae, galbani, papaveris lacrimae, croci, costi inciae singulae; styracis, resinae terebenthinae pondo sextantes, melabsinthi cyathus. Ex quibus ad magnitudinem fabae Aegyptiae et mane et cenato dari debet*" (5.25.16).

---

[33] See also Cels. 6.7.2C.

"For painful urination long pepper, castory, myrrh, galbanum, poppy tears, saffron, costmary, 28 grms. each; storax and terebinth resin[34], 56 grms. each, honey with absinth 42 c.cm. Of this an amount the size of an Egyptian bean[35] should be taken in the morning and after dinner".

ANALYSIS

INGREDIENT	AMOUNT
Long pepper	28 g
Castory	28 g
Myrrh	28 g
Galbanum	28 g
Poppy tears	28 g
Saffron	28 g
Costmary	28 g
Storax	56 g
Terebinth resin	56 g
Honey with absinth	42 c.cm

This produces a large quantity of medicine i.e. 308 g dry ingredients in 42mL of honey with absinth which constitute 9% of the ingredients.

2.5.2.5 Headache

The ancients seem to have found relief from headache by using poppy, as Celsus describes:

"*Si capitis dolores sint.. luvat etiam panis cum papavere iniectus, vel cum rosa, cerussa spumave argenti*" (3.10.2).

"If there is headache[36] ...There is benefit from the application of bread soaked in poppy head decoction, or in rose oil containing cerussa or litharge".

---

34 *Pistacia terenbinthus* L. (see Diosc. 1.71).
35 About 4 grams.
36 See also Diosc. 4.64.4 and Cels 5.25.3.

2.5.2.6 Arthritis, pain in the joints and inflammation

As the following quotations demonstrate, the use of poppy in the treatment of arthritic pains and inflammation was quite common among the ancient doctors.

"*Ad dolores artiuilorum Sosagorae: plumbi combusti, papaveris lacrimae, corticis hyoscyami, styracis, peucedani, sebi, resnae, cerae, pares portiones*"
(Cels. 5.18.29).

"The emollient of Sosagoras[37] for pain in joints contains calcined lead, poppy tears, hyoscyamus bark, sulphurwort, suet, pine resin and beeswax, equal parts" [trans. Spencer, Vol. 2 p. 28, slightly modified].

Pliny writes that the poppy can be used as a liniment for gout, but since this plant is so potent, only the leaves can be put onto the inflamed parts.

"...Papaveris sativi...Podagris inlinitur cum lacte mulierum, - sic et foliis ipsis utuntur" (*H.N.* 20.201).

"Of the cultivated poppy. As a liniment for gout it is applied with woman's milk (the leaves by themselves are also used).

Dioscorides agrees with Pliny's sources as far as woman's milk is concerned when treating gout but he adds saffron to the recipe (4.64.4).

2.5.2.7 Ulcerations and pain in mouth and ear

Celsus prescribes the same compounded medicaments for ulcerations of the mouth and ear:

"... *Est Menophili validum admodum, quod ex his constat: piperis longi P. * I; castorei P.* II; murrae, croci, papaveris lacrimae, nardi Suriaci, turis, malicori, ex Aegyptia faba partis interioris nucum amararum, mellis quam* optumi, *singulorum P.*IIII* " (6.7.2C).

[37] No other reference to Sosagoras is found. His name is synonymous with this emollient.

"... *At si multum puris malusque odor est, aeruginis rasae, turis, singulorum P. * II; mellis cyathi duo; aceti quattuor simul incocuntur. Ubi utendum est, dulce vinum miscetur. Aut aluminis scissilis, papaveris lacrimae, acaciae suci par pondus miscetur, hisque adicitur hyoscyami suci dimidio minor quam unius ex superioribus portio, eaque trita ex vino diluuntur. Per se quoque hyoscyami sucus satis proficit*" (6.7.2D).

"...There is the very active remedy of Menophilus, which consists of: long pepper 4 grms.; castoreum 8 grms.; myrrh, saffron, poppy tears, Syrian nard, frankincense, pomegranate rind, the embryo of an Egyptian bean, bitter almonds, and the best honey 16 grms. each..."

"...But when there is much pus, and odour bad, verdigris scrapings[38] and frankincense 8 grms. each, honey 85 c.cm.; vinegar 170 c.cm. are boiled together. For use, it is mixed with sweet wine. Or equal weights of scissile alum, poppy tears and acacia juice are mixed together, and to these is added of hyocyamus juice less than half the quantity of each one of above; and these are pounded together and diluted with wine. Also hyoscyamus juice is sufficiently beneficial by itself".

2.5.2.8 Colic

Poppy was also an ingredient in Celsus' medication for "colic". It seems that the ancients used this terms for a wide variety of ailments related to the stomach.[39]

"*Colice vero Cassi ex his constat: croci, anesi, castorei, singulorum P. * III; petroselini P. * IIII; piperis et longi et rotundi, singulorum P. * V; papaveris lacrimae, iunci rotudi, murrae, nardi, singulorum P. * VI; quae melle excipiuntur. Id autem et devorari potest et ex aqua calida sumi*" (5.25.12).

"The pill [40] of Cassius for colic contains saffron, anise, castory, 12 grms. each, parsley 16 grms., pepper both long and round, 20 grms. each, poppy tears, round rush, myrrh, nard, 24 grms. each; these are taken up in honey. It may be either swallowed as it is or dissolved in hot water".

---

38 Oxidated Copper which forms when the copper is covered by strong vinegar and left to react (See Diosc. 5.79).

39 Siegel (1976:49) translates Galen's definition as follows: "Therefore the so-called colic-like affections are at least preceded by indigestion (apepsia), flatulence, vomiting and nausea which can last for a long time without bringing up anything, also by burning in the epigastric area, by distress and malaise".

40 For more information on the compounding of a pill [i.e. tablet or capsule] see Galen, *De Comp. Med.*, 9.4; 13.276.

"*Confectio medicamenti, quod colicon nominatur: ex his constat: costi, anesi, castorei, singulorum P^0 * III, petroselini P^0, deñ III, piperis longi et rotundi, singulorum P^0 * II, papaveris lacrimae, iunci rotundi, myrrae, nardi, singulorum P^0 * VI; quae melle excipiuntur. Id autem et devorari potest et ex aqua calida sumi*" (Cels. 4.21.2).

"The composition of the medicament termed colicos is as follows: costmary, anise, castor, of each 12 grms., of parsley 12 grms., of long and round peppers, a.a.[41] 8 grms., of poppy tears, round rush, myrrh, nard, a.a. 24 grms., all mixed together with honey. This may be either swallowed by itself or taken in hot water".

ANALYSIS OF THE COLIC REMEDY

INGREDIENT	AMOUNT
Costmary	12 g
Anise	12 g
Castor	12 g
Parsley	12 g
Long and round peppers	8 g.
Poppy tears	24 g
Round rush	24 g
Myrrh	24 g
Nard	24 g

In this colic-mixture, the gross amount of ingredients is 152g. It contains 24g of poppy, which constitutes 15.7%. The amount of poppy is, however, equal to that of the round rush, myrrh and nard.

Pliny maintains that poppy is also a remedy for colic[42] when it is mixed with powdered gentian.[43]

41 Scarborough (2008) suggests "each".
42 Plin. *H.N.* 26.74.
43 *Gentiana lutea* L. and *Gentiana purpurea* L. were both used (Beck 2005:432).

2.5.3 INFLAMMATIONS

The capsules were grounded and mixed with barley groats and it was applied to the affected areas. The ancients used it to cure inflammations and erisypelas (Diosc. 4.64.2).

Here follows a description of Celsus' recipes for relieving inflammation and pain.

"*Conposita vero ad inflammationem doloremque leniendum haec fere sunt: castorei, papaveris lacrimae pares portiones conteruntur; deinde adicitur his passum. Vel papaveris lacrimae, croci, murrae par modus sic teritur, ut invicem modo rosa modo passum instilletur. Vel id, quod amarum in Aegyptia faba est, conteritur rosa adiecta; quibus murrae quoque paulum a quibusdam miscetur vel papaveris lacrimae... Vel castorei, murrae, papaveris lacrimae pares portiones cum passo* (6.7 D - E).

*...Vel papaveris lacrima[e] ex aceto. Licet etiam compositione uti Themisonis, quae habet castorei, opopanacis, papaveris lacrimae, singulorum P. * II; spumae Lyci P. *III* " (6.7.F).

"But the compositions for relieving inflammation and pain generally employed are: castoreum and poppy tears in equal amounts, pounded together; then to these there is added raisin wine. Or poppy tears, saffron and myrrh in equal quantities pounded, while rose oil and raisin wine are dropped in by turns. Or the bitter part of the Egyptian bean pounded up with rose oil added; with these some mix a little myrrh or poppy tears... Or castoreum, myrrh and poppy tears, equal parts, with raisin wine..."

Or poppy tears in vinegar. Themison's[44] compound may also be used; it contains: castoreum, opopanax and poppy-tears 8 grms. of each, buckthorn scum 16 grms".

2.5.3.1 Eye inflammations

Dioscorides prescribes poppy mixed with a boiled egg yolk and saffron for eye inflammations (4.64.4).

In Dioscorides' discussion of the use of poppy for eye inflammations he cites four different sources: Diagoras, Erasistratos, Andreas and Mnesidamos. This is a clear indication of the importance of this drug. According to Dioscorides, Diagoras[45] reports that Erasistratos rejects the use of poppy for earaches and ophtalmia because it weakens the sight and it is soporific. Andreas[46] also warns that, if it is not adulterated, those anointed with poppy would be blinded. Mnesidamos agrees and adds that the only suitable use is to induce sleep through smell, otherwise it is harmful. Dioscorides regards these assertions as decidedly false, and refuted by experience, because the efficacy of a drug is confirmed by its performance (4.64.6).

The ancients had different ways of medicinal applications. As it can be seen in the following paragraph, they even spread it on wool or lint and applied it to the head or eyeball.

"Papaveris*...idque in linteolum inlinere, et fronti adglutinare, ut conpressis venis pituitae impetum cohibeat. Si crocum non est, tus idem facit. Linteolo an lana excipiatur, nihil interes. Superinungui vero oculi debent, sic ut croci quantum tribus digitis conprehendi potest, sumatur; murrae ad fabae, papaveris lacrimae ad lenticulae magnitudinem; eaque cum passo conterantur, et specillo super oculum inducantur*" (Cels. 6.6.1.H).

"Poppy...then spread on lint and stuck on the forehead, in order that by compressing the veins the flow of rheum may be checked. If saffron is not at hand, frankincense has the same effect. Whether it is spread on linen, or on wool, makes no difference. There should be smeared over the eyeball, of saffron as much as can be taken up in

---

44 Themison of Laodicea fl. in Rome under Augustus (31 BC - AD14). He is one of the purported founders of the Methodists (Scarborough 1995:19).

45 There is great uncertainty regarding the physician, Diagoras of Cyprus (fl. 400 BC), because Wellmann dates him back to the third century BC His works are embedded in Pliny's *Naturalis Historiae*, and it is against him that Dioscorides argues about opium (Scarborough 1995:19).

46 Andreas was a physician in the Hellenistic age (d. 217 BC) (Scarborough 1995:5).

three fingers, of myrrh an amount the size of a bean, of poppy tears the size of a lentil: these are pounded up in raisin wine, and applied on a probe to the eyeball".

2.5.3.2 Inflammation of the womb

Celsus also includes poppy in his remedy for inflammation of the womb:

"*Item si vulva dolens somnum prohibet, croci P. * = =; anesi, murrae, singulorum P. * I; papaveris lacrimae P. * III; cicutae seminis P. * VIII miscentur excipiunturque vino vetere, et quod lupini magnitudinem habet in tribus cyathis aquae diluitur. Id tamen in febre periculose datur*" (5.25.5).

"Again, if inflammation of the womb prevents sleep take saffron 1.33 grms., anise and myrrh, 4 grms. each, poppy-tears 12 grms., hemlock seed 32 grms. These are mixed together, and taken up in old wine, and a pill the size of a lupin is dissolved in 125 c.cm. of water. It is dangerous, however, to give it when there is fever".[47]

2.5.4 OTHER EFFECTS

According to Dioscorides, the meconium does become more effective, if juice of hypocist[48] and of shittah[49] tree [acacia gum] is mixed with it. The seed of the black poppy, ground up, is given to drink with wine for diarrhoea and leucorrhea[50] (4.64.3). The pounded seeds cause a discharge of urine[51]. As for the juice, helpful for digestion[52], and it comes to the aid of abdominal conditions; (4.64.3) but when too much of it is drunk, it plunges the patient into a coma and is deadly (4.64.3).

Pliny beleived that when opium is mixed with wine and administered immediately, it acts as an antidote for the stings of scorpions[53] or it is used for fluxes of the eyes.[54]

---

47 See analysis in Chapter 5, p 88.
48 *Cytinus hypocistis* L. (Beck 2005:439).
49 According to Beck (2005:466), three species are a possibility. This could be anyone of the following three species: *Acacia arabica* LSJ; Any *Acacia* species; or *Genista acanthoclada* LSJ.
50 A whitish or yellowish discharge of mucus from the vaginal opening (Martin 2002:390)
51 Cels 4.17.1
52 The following recipe is one for relief of bad digestion.
"*Potest tamen etiam ad concoquendum, quod habet papaveris lacrimae, galbani, singulorum P. * I; murrae, castorei, piperis, singulorum P. * II. Ex quibus, quod ervi magnitudinem habet, satis est devorasse*" (Cels. 5.25).
"There is one, however, which actually promotes digestion; it is composed of poppy tears and galbanum, 4 grms. each, myrrh, castory, and pepper, 8 grms. each. Of this it is enough to swallow an amount the size of a vetch".
53 *H.N.* 20.209
54 *H.N.* 25.143

For the relief of erysipelas or for the healing of wounds, poppy is mixed with vinegar.[55] The dark poppy is given in wine for coeliac trouble[56] and when the whole calyx of the rhoeas is eaten, it purges the body,[57] downwards[58] and upwards.[59] Some used the root of this plant in a posset of mead for epileptics.[60]

It is most beneficial to the ears.[61] Pliny[62] tells us that opium was used by the elderly infirm to commit suicide (Cilliers *et al.* 2000:92). The juice is also effective to suppress coughing[63, 64] and for inflammations of the sinews or of the intestines or pains in the sides.[65] Celsus adds that the fragments of bone were extracted with the leaves of wild poppy[66] and when it is combined with honey, it extracts splinters of bone.[67]

---

55 *H.N.* 20.201; Diosc. 4.64.4
56 *H.N.* 20.202
57 Plin. *H.N.* 20.204
58 Theop. H.P. 9.12.4. In medicinal terms this has laxative effects.
59 Theop. *H.P.* 9.12.5
60 Theop. *H.P.* 9.12.5
61 Plin. *H.N.* 32.77
62 Plin. *H.N.* 20.199
63 Plin. *H.N.* 20.188; Cels. 5.25.9
64 Here follows a recipe to relieve coughing:
"*Si tussis somnum prohibet, ad utrumque Heraclidis Tarentini: croci P. * =; murrae, piperis longi, costi, galbani, singulorum P. * = -; cinnamomi, castorei, papaveris lacrimae, singulorum P. * I* " (Cels. 5.25.9).
"If cough prevents sleep the pill of Heracleides of Tarentum relieves both; it contains saffron 0.66 grm., myrrh, long pepper, costmary, galbanum, 1 grm. each, cinnamon, castory and poppy-tears, 4 grms. each" .
65 Plin. *H.N.* 22.123
66 Plin. *H.N.* 23.119
67 Plin. *H.N.* 23.128

Poppy is a warming agent and in combination with pericarpum,[68] it is administered to counteract hemlock.[69] Looseness of the bowels is cured when poppy is mixed with powdered plantain[70] and black poppy acts as a less violent emetic.[71] For dysentery poppy is mixed with eggs, the ash of the shells of the eggs and wine.[72] A remedy for ileus[73] is the roasted liver of cocks or the skin of their crop, usually thrown away, mixed with dried poppy juice.[74] Beneficial for sciatica[75] is a spotted lizard to which is added three *oboli* of black poppy.[76],[77]

A very popular remedy amongst the ancient authors was theriac, a mixture made of several ingredients, including poppy extract and snake venom (Siegel 1976:134). Galen provides three recipes for the theriac (*On Antidotes* 15.5-15 K) which he prescribed for the emperor, Marcus Aurelius (121 – 180 AD) to cure his chestpains. Galen reports that theriac also cured the emperor's insomnia and severe body pains.[78],[79]

2.6 TOXICITY

2.6.1 ANCIENT ANTIDOTE

Pliny recommends must as a particularly efficacious antidote against opium poisoning.[80] He also mentions neat wine[81] and a decoction of dried figs [82] that could be used to counteract the effects of poppy.

---

68 *Auranti pericarpium* L. also known as bitter orange peel.
69 Plin. *H.N.* 25.131
70 Plin. *H.N.* 26.44
71 Plin.*H.N. 26.67*
72 Plin.*H.N. 29.43*
73 Intestinal obstruction, usually obstruction of the small intestine (ileum) (Martin 2002:342).
74 Plin. *H.N.* 30.59
75 Pain felt down the back and outer side of the thigh, leg, and foot. It is usually caused by degeneration of an intervertebral disc (Martin 2002:617).
76 Plin. *H.N.* 30.71
77 For effects of the wild poppy, see Plin. *H.N.* 20. 205, for a second variety of wild poppy see Plin. *H.N.* 20.207 and for the third variety, *tithymalon* (mecon), Plin. *H.N.* 20.209.
78 Galen *On antidotes* 14.3-6 K;
79 See also the recent article of Retief *et al.* 2007:56-65.
80 Plin. *H.N.* 23.30
81 Plin. *H.N.* 23.43
82 Plin. *H.N.* 23.80

MODERN POPPY

Papaver somniferum is the source of the toxic and extremely habit forming narcotic heroine or diamorphine. The manufacturing of these products are prohibited in some countries. Commercial varieties vary in appearance and the quality of opium is roughly classified as "Alba" (soft or shipping opium used for smoking) or "Glabra" (druggist's and manufacturer opium used mainly for the extraction of alkaloids) (Usher 1974:438). In some countries the "Hadjikuy"-type is considered the best, followed by Malatia, Kharput and Sila (Uphof 1968:386).

2.7 MORPHOHOLOGY

This family of herbs or sub-shrub is an annual or perennial herb that grows up to 1,5 metres high. It varies much in the colour of its flowers, as well as in the shape of the fruit and colour of the seeds. All parts of the plant, but particularly the walls of the capsules, or seed-vessels, consist of a system of laticiferous (latex) vessels, filled with white latex which contains the alkaloids (Van Wyk *et al.* 2004:225).

It has spirally arranged leaves which are entire or lobed or dissected (Heinrich 2004:40).

The generally large flowers vary in colour from pure white to reddish purple but are usually pale lilac with purple spots at the base (Williamson 2003:355). It has bisexual flowers and actinomorphyc symmetry. The flower has two to three *calices* (sepals), a fully enclosing bud and an inferior gynaecium which make it a bisexual plant (Heinrich 2004:40). There are four to twelve separate corolla (petals) and in the wild variety, they are pale lilac with a purple spot at the base of each petal (Van Wyk *et al.* 2004:225).

The fruits are classified as capsules that open with pores and vary much in shape and size. They are usually hemispherical, but depressed at the top, where the many-rayed stigmata occupy the centre; they have swollen rings below where the capsules join the stalk. As they mature and ripen they change to a yellowish brown, and are then cut from the stem if the *dried* poppy heads are required (Van Wyk *et al.* 2004:225). The seeds are small, greyish, reniform and attached to the internal projections or placentae (Williamson 2003:355).

2.7.1 DIFFERENT SPECIES

Different species of the family *Papaveraceae* are found. The following species have been identified (Van Wyk *et al.* 2004:138, 225) and by the Tazmanian Department of Justice (2008):

1. *Papaver rhoeas* – Corn poppy (traditional sedative)
2. *Papaver bracteatum* - Persian poppy
3. *Papaver orientale* - Oriental poppy
4. *Papaver pseudo-orientale* - Pseudo-oriental poppy
5. *Papaver hybridium* - Rough poppy
6. *Papaver dubium* - Long-head poppy
7. *Papaver argemone* - Pale poppy

2.7.2 ONTOGENIC VARIATION

The dried fruits, collected before dehiscence has occurred, contain very small amounts of morphine, but traces of several dozens of alkaloids are found (Sweetman 2002:1099). The morphine content of the capsule is the highest 2.5 - 3 weeks after flowering. The secondary alkaloids (codeine, thebaine, narcotine and papaverine), reach their maximum somewhat earlier (Evans 2002:65).

2.7.2.1 Poppy seed

The little black seed of the poppy is found enclosed in a capsule (Van Wyk *et al.* 2004:225) and contains no opium (Duke 1095:344; Uphof 1968:386).

The oil, obtained from the seeds has no alkaloid content and is mainly used for culinary purposes (Sweetman 2002:1653), sometimes instead of olive oil (Sweetman 2002:1653). According to Sweetman (2002:1653), the seed-oil is also used in the preparation of Iodised Oil Fluid Injection (BP 2001), which is mainly used in India for lighting (Usher 1974:438). Commercial grades are used in making soaps, paints and varnishes (Uphof 1968:386).

2.8 DISTRIBUTION AND HARVEST TIME

This plant is native to Eurasia (Heinrich 2004:241) and from Spain through central Asia (Evans 2002:129), and Heinrich (2004:241) tells us that people cultivate it

widely for food (the seed and seed oil), and plant it as an ornamental plant (Duke 1085:344).

Sowing usually takes place in November and collection from April to June (Evans 2002:357).

2.9 PROCESSING OF THE PLANT

Opium is extracted from the poppy heads before they have ripened. Poppies grown in the East yield opium in much larger quantities than those grown in Europe (Henry 1924:252). Sweetman (2002:1099) states that the capsule is mildly sedative and is used as a liquid or syrup. Usher (1974:438) writes that after ten to twenty days after the capsule has formed, and when the petals have fallen from the flowers, incisions are made in the wall of the unripe capsules (especially in the afternoon - Evans 2002:257), care being taken not to penetrate to the interior. The exuded juice, partially dried, is collected (in the morning) by scraping - the scrapings being formed eventually into cakes, which are wrapped in poppy leaves or paper and further dried in the sun. The white milky juice darkens during the drying (Henry 1924:252). Evans adds (2002:258) that each capsule is cut several times at intervals of 2 or 3 days. According to Van Wyk (2004:225) the opium is still obtained today in exactly the same way as Dioscorides describes. Shallow cuts are made in the raw poppy fruit and the white latex that oozes out of the cuts later becomes brown. After the latex is collected, it is stored to dry.

Deodorised opium: "Denarcotised" opium is powdered opium freed form its odour and nauseating substances by treatment with ether. It contains 10 - 10.5% anhydrous morphine.

Granulated opium: Opium is dried at under 70° and reduced to a 16 - 50 mesh powder and adjusted with lactose or another inert diluent to contain 10 - 10.5% anhydrous morphine

Powdered opium: Opium is dried at a temperature not higher than 70°, finely powdered and adjusted with lactose or another inert diluent to contain 10 - 10.5% anhydrous morphine (Budavari 2001:1226).

2.10 ADMINISTRATION OF THE PLANT

Duke (1985:344) says that if the plant is boiled in oil, it aids induration. A tincture is made to treat cancerous ulcers. Smoking the plant is said to cure cancer of the tongue. The decoction containing the capsule is said to cure uterine cancer and an injection of the seed decoction apparently has the same effect (Duke 1985:344). Heinrich (2004:241) writes that for pharmaceutical use the decoction can be treated to form "prepared opium" but opium or the whole dried capsule (poppy straw) is now commercially used to extract alkaloids.

The seeds are used extensively in baking and is sprinkled on rolls and bread since it is a great source of energy. The seed oils are used for the preparation of emulsions (Duke 1985:344).

2.11 PHYTOCHEMISTRY

Opium is the air-dried latex of *Papaver somniferum* and the plant is mainly cultivated to obtain the drug. The latex is obtained by cutting unripe fruit capsules of the plant. The two main alkaloids found in the opium of *Papaver somniferum* are morphine (which is converted to codeine) and codeine (Van Wyk *et al.* 1997:8). The seeds contain a fixed oil, mecinic acid (Williamson 2003:355).

Their names and formulas are as follow (Henry 1924:254):

ALKALOID	FORMULA	ALKALOID	FORMULA
Morphine	$C_{17}H_{19}O_3N$	Laudanidine	$C_{20}H_{25}O_4N$
Codeine	$C_{18}H_{21}O_3N$	Codamine	$C_{20}H_{25}O_4N$
Neopine	$C_{18}H_{21}O_4N$	Papaveramine	$C_{21}H_{25}O_6N$
Pseudomorphine	$(C_{17}H_{18}0_3N)_2$	Xanthaline	$C_{20}H_{19}O_5N$
Thebaine	$C_{19}H_{21}O_3N$	Protopapverine	$C_{19}H_{19}O_4N$
Narcotine	$C_{22}H_{23}O_7N$	Meconidine	$C_{21}H_{23}O_4N$
Gnoscapine	$C_{22}H_{23}O_7N$	Lanthopine	$C_{23}H_{25}O_4N$
Oxynarcotine	$C_{22}H_{23}O_8N$	Protopine	$C_{20}H_{19}O_5N$

ALKALOID	FORMULA	ALKALOID	FORMULA
Narceine	$C_{23}H_{27}O_8N$	Cryptopine	$C_{21}H_{23}0_5N$
Papaverine	$C_{20}H_{21}O_4N$	Tritopine	$(C_{21}H_{27}O_3N)_2O$
Laudanosine	$C_{21}H_{27}O_4N$	Rheadine	$C_{21}H_{21}O_6N$
Laudanine	$C_{20}H_{25}0_4N$	Hydrocotarnine	$C_{12}H_{15}0_3N$

Plus about 50 more...

The alkaloids represent approximately 10% of the dried latex (Heinrich 2004:241), but as much as over seventy known isoquinoline alkaloids (Van Wyk *et al.* 2004:419) are identified in *Papaver* spp.

2.11.1 MORPHINE

Morphine is the main alklaloid and is chemically known as (5α,6α)-7,8-Didehydro-4,5-epoxy-17-methylmorphinan-3,6-diol.

$C_{17}H_{19}NO_3$ with a molecular weight of 285.34. The percentage of the elements in the carbon chain is as follows: C = 71.56%, H = 6.71%; N = 4.91% and O = 16.82%.

Morphine is seen as the principle alkaloid which contains 9-14% anhydrous morphine, occasionally in the (-)-form.

It has orthorhombic, columnar prisms from anisole with a melting point of 197°C. This high melting form sublimes (Budavari 2001:1121).

2.11.2 BIOGENESIS OF OPIUM

Modern phytochemistry has demonstrated through biogenesis the stages by which the plants create morphine in timed sequences, verifying in modern times the ancients' empirical observation of morphine harvesting. In other words, Dioscorides observed that his contemporary opium cultivators gathered the latex when the percentage of morphine is greatest in poppy capsules (Diosc 4.64), not when the capsules are ripe (Evans 2002:357). Alkaloids were being created through experience. We use the drug because we have learnt through millenia that it was useable as a narcotic.

Biogenesis of thebaine, codeine and morphine simply demonstrates by laboratory techniques what the Greek and Roman physicians knew from long-term observations (Evans 2002:359).

2.11.3 STORAGE

According to Evans (2002:361), opium requires careful storage to maintain the morphine content. When it is dried at 100°C and stored out of contact with air, the loss of morphine is small. The loss of morphine is also due to the action of the peroxidase enzyme, opiase.

2.11.4 TESTS FOR OPIUM ALKALOIDS

The solubility of morphine in sodium hydroxide solution is explained by its phenolic nature. Thus, codeine is precipitated by sodium hydroxide (Evans 2002:361).

2.12 PHARMACOKINETICS

Morphine is well absorbed when given orally and has a short half-life (of 2 - 3 hours), so that administration of an immediate release oral preparation offers a flexible means of dosage titration. Once initial pain relief has been achieved, administration of modified-release morphine tablets every twelve hours is more convenient for maintenance of analgesia in cases of severe chronic pain (Sweetman 2002:2). Opium acts less rapidly than morphine since opium is more slowly absorbed (Sweetman 2002:70). Oral bioavailability is 12 - 36% (SAMF 2006:391).

2.13 PHARMACOLOGY

The five major alkaloids which are responsible for the physiological effects are mainly divided into two distinct chemical classes, phenanthrenes (morphine, codeine thebaine) and benzylisoquinolines (papaverine and noscapine) (Reisine 1996:527). Their narcotic effect descends in this order: Morphine (10% or more up to 14% of opium) has the strongest narcotic effect and thebaine (0,6%) the slightest. Since the alkaloids are highly addictive, they must be used with care.

Opioids bind to κ, μ and δ opioid receptors in the spinal cord and act as pain transmission neurons, thus opioids exert a powerful analgesic effect directly on the

spinal cord. The activation of K (Kappa), μ (Mu) and δ (Delta) receptors exert supraspinal and spinal analgesia but the activation of *μ*-receptors also causes sedation, the inhibition of respiration, slowed GI transit and the modulation of hormones (Reisine *et al.* 1996:523). Opioids act at one or more of these receptors as full or partial agonists or antagonists. Morphine and similar opioid agonists (also called *μ* agonists) are considered to act primarily at μ and perhaps κ and δ receptors (Sweetman 2002:69).

2.13.1 MORPHINE

Morphine suppresses the central nervous system, mainly in the brain, as well as the cortex and medullary centres, while it stimulates the spinal cord (Dreisbach 1987:324). The endorphine receptors are modulated with morphine, which is why intense pain (for example cancer, burn wounds, surgery and fractures) are relieved by morphine (Van Wyk *et al.* 2004:369). Morphine also suppresses the respiratory system. The pupil contracts and the drug causes a slight fall in body temperature (Henry 1924:306). The usual dose of morphine for preanesthetic medication is 8 – 12 mg intramuscular especially if pain is present. To induce analgesia and unconsciousness, morphine is given slowly intra-venously in doses of 1 – 3 mg/kg over 15 – 20 minutes (Jaffe *et al.* 1990:486) but a dosage of 0.2 – 0.3 gram is lethal (Henry 1924:306).

2.13.2 PAPAVERINE

Papaverine produces a light sleep which does not become deeper if the papaverine dose does not increase. It also slows the heart rate (Henry 1924:306) and it also promotes vasodilation which increases the oxygen and glucose supply to the cerebral circulation. It relieves peripheral veno-occlusive arterial disease (Van Wyk *et al.* 2004:352) and is classified as the fourth most common coronary vasodilator (Duke 1985:344).

2.13.3 CODEINE

Codeine stimulates the spinal cord and the lower parts of the brain, but suppresses the cortex and medullary centers (Dreisbach 1998:326). It is an excellent cough suppressor of the cough centre in the Medulla oblongata (Van Wyk *et al.* 2004:365),

as well as an antitussive (Duke 1985:344). It causes restlessness and excitability rather than sleep (Henry 1924:307) and it is also used to produce analgesia (Van Wyk *et al.* 2004:378). Codeine is also found in over-the-counter drugs e.g. 'sudafeds'. This is problematical because many people buy this preparation, not for their pain-killing property, but to produce a crude form of methamphetamines.

2.13.4 NARCOTINE

Narcotine is mainly used as a hypnotic drug because it has a very low depressant action (Henry 1924:307). Chronic diarrhoea and Crohn's disease (chronic inflammation of the gut) is relieved by the narcotine in opium because it calms down the motility of the gut (Van Wyk *et al.* 2004:358)

2.13.5 THEBAINE

Thebaine is metabolised to oxydihydrocodeinone, which is a powerful narcotic, used in severe surgical procedures (Henry 1924:308).

2.14 TOXICITY

The commonest side-effects of opioid analgesics are nausea, vomiting, constipation, drowsiness and confusion, which generally develop with long-term use. Urination may be difficult and there may be ureteric or biliary spasm as well as an antidiuretic effect.[83] Dry mouth, dizziness, sweating, facial flushing, headache, vertigo, bradycardia or tachycardia,[84] palpitations, orthostatic hypotension, hypothermia, restlessness, moodchanges, decreased libido, hallucinations and miosis also occur (Sweetman 2002:68). It also prolongs the awakening from general Anaesthesia and wheezing may develop in patients who suffer from asthma. The respiratory depressant action may increase the intracranial pressure as a result of retention of carbon-dioxide (CO_2) and subsequent cerebral vasodilatation (Kennedy *et al.* 1990:280).

Tolerance develops when opioids are repeatedly administered and gradually more and more is required to receive the desired effect. Physical dependence also develops and the abstinence syndrome is experienced when the drug is abruptly

---

[83] This happens because of opium's stimulant effect on the smooth muscles (Kennedy *et al.* 1990:280).
[84] Because of a vagotonic effect (Kennedy *et al.* 1990:280).

stopped. Withdrawal is directly associated with the strength of the opioid – the stronger the opioid, the more intensely withdrawal is experienced.

Tolerance usually manifests after 14 – 21 days if large doses are taken at short intervals.

Symptoms found are rhinorrhea, lacrimation, yawning, chills, pilo-erection, hyper-ventilation, hyperthermia, mydriasis, muscular cramps, vomiting, diarrhoea, anxiety and hostility (Schumacher *et al.* 2004:508).

Psychological dependence occurs when the feeling of euphoria, indifference to pain and the sedation-effect overrules the reality (Heinrich 2004:241). Opium is the source of the toxic and extremely habit-forming narcotic heroin or dimorphine, prohibited in most countries (Duke 1985:344).

2.14.1 MODERN ANTIDOTE

Naloxone is an opioid antagonist with bulkier substituents at the N_{17} –position and has a high affinity for Mu-receptors. This drug is given when an opioid overdose was taken and it reverses the severe effects of the opioid within minutes. It stabilises the respiration tempo, consciousness level, pupil size, bowel activity and the awareness of pain. In addictive patients, naloxone will cause an abstinence syndrome because opioid antagonists are very selective in blocking the effects of opioid analgesics, although it is usually physiological in nature. Thus, an individual who has received one drug can not become normal by using / administering another drug (Bloom 1990: 255).

Combretum (*Combretum sundaicum* Mig.) is also known as Opium antidote. This is a plant that is found in China and its taste is slightly astringent and tea-like. The constituents are unknown but the related *C. caffrum* contains stilbenes and the combretastatins. It is used in China to treat the opium habit and break the addiction (Williamson 2003:137).

2.14.2 HEROIN

There are street names for heroin like: Big H, Blacktar, Brown sugar, Dope, Horse, Junk, Mud, Skag, Smack (National Institute on Drug Abuse (NIDA: 2008). For a

detailed list of all streetnames known, see the website of the Office of National Drug Control Policy.

2.14.2.1 What is heroin?

Heroin (diacetylmorphine) is a semi-synthetic opiate which acts as a central nervous system (CNS) depressant and an analgesic. In its purest form heroin is a white powder (Parry 2008), derived from the dried milk of the opium poppy. When impure it can be brown in colour, it contains morphine and codeine which both are effective painkillers (SWAPO 2008).

2.14.2.2 Modes of administration

Historically, the main mode of heroin use has been through injection. Improvements in the purity of heroin and the fear of HIV have resulted in more new users snorting or smoking heroin. Heroin users prefer smoking heroin with dagga or to inhale the vapours ("chasing the dragon") (Parry 2008).

2.14.2.3 Short-term effects

Heroin acts on the opioid receptor sites in the brain, resulting in feelings of intense pleasure and a dulling of pain. This rush includes a flushing of the skin, a dry mouth, heaviness in the limbs, and may involve nausea, vomiting, and severe itching (Parry 2008).

These initial effects are accompanied by feelings of relaxation and drowsiness, dulling of mental functions, and slowed breathing and cardiac functions. The rush occurs within 7 to 8 seconds of intravenous heroin use and within a couple of minutes of snorting or smoking heroin (Parry 2008).

2.14.2.4 Long-term effects

With chronic use, psychological and physical addiction occurs and tolerance and craving for the effects of heroin develop. If heroin is not used regularly, the addicted user will experience withdrawal symptoms, for example hypothermia, stomach cramps, insomnia, diarrhoea, and vomiting. In large doses, heroin toxicity may occur due to the depressant action of heroin on the central nervous system (CNS), which

may lead to coma and potentially, death. The risk of overdosing increases with the concurrent use of other CNS depressants (such as alcohol), greater heroin dependence, and a longer history of heroin consumption. Respiratory problems (e.g. pneumonia and tuberculosis) accompany reduction of the body's ability to resist and fight infection.

Adverse psychological consequences: impaired concentration, attention, and memory; impaired psychological development (especially for adolescents) together with impaired social and occupational functioning (Parry 2008).

2.15 CONCLUSION

With the development of increasingly sophisticated phytochemical research and biological assays, details of pharmacology are substantially augmented. *Papaver somniferum* (from which the narcotic alkaloid morphine has been isolated) acts on the κ, μ and δ opioid receptors in the spinal cord which act as pain transmission neurons (§2.13). Potent opioids such as morphine are mainly used in the treatment of severe acute non-malignant pain and cancer pain. Their use in chronic non-malignant pain is somewhat controversial because of fears of psychological dependence and respiratory depression (§2.13.1).

With the help of technology and intense research, researchers found eight different **species** of Papaver (§2.7.1), compared with the three species that Dioscorides identified in antiquity (§2.1). When the description of the ancient and modern **morphology** is compared, it is possible to make the assumption that it is indeed the same plant that was used in ancient times for its soporific effects. The flowers are described as red in both times, as well as the capsule, the poppy juice (poppy tears in antiquity) and the leaves (§2.7).

As described in the chapter, Pliny ascribed soporific properties to the **seed** (§2.5.1). Dioscorides differed from him, saying that poppy seeds were useful for culinary purposes, since it has nourishing value. Through phytochemistry, it is scientifically shown that poppy seeds have no alkaloid content (§2.7.2.1), which refutes Pliny's assumption that the seeds induce sleep.

It is interesting to see that the procedure for **obtaining** poppy juice (by cutting the capsule and collecting the tears (§2.3)), is still followed in modern times (§2.9). Even the time of collecting the juice corresponds: the ancients waited until the dew evaporated before they made the incisions, and modern botanists say that it is the best to do incisions in the afternoon. It is only now that ontogenic variation is employed to determine when the poppy tears contain the most opium (§2.7.2).

There were different ways of **administering** the drug. Even though the poppylatex (*meconium*) was mainly used to form lozenges as soporific, the Greeks and Romans also drank a decoction of the leaves and capsules. They made pills and plastered pounded seeds, capsules and the calyx on the forehead and temples. The face could be bathed in a decoction of the leaves and it was inserted as a suppository (§2.4). In modern pharmacy, morphine tablets, injections and powder are available, but tinctures are also used. The leaves are also smoked, but oral dosages are the most common (§2.10).

The ancients knew the opium poppy very well. Throughout antiquity, it was used as **anodyne and narcotic**. Many recipes were available, of which *theriac* became quite popular in Galen's lifetime as a physician (§2.5.4). Earlier authorities expressed doubts about the use of opium poppy and Dioscorides refuted Diagoras and Erasistratus on the basis of experience. Today we know that the alkaloids of the opium poppy especially codeine and morphine are effective narcotics, when used moderately (§2.11).

The inducement of sleep (§2.5.1) and pain-relief (§2.5.2) were the most common uses in antiquity. The narcotic effect was most useful during surgery, since the patient was asleep without feeling any pain (§2.5.1). These effects occur due to the enormous alkaloid content in the plant, with morphine as the principal alkaloid. According to Van Wyk *et al.* (2004:369), morphine modulates the endorphine receptors, which is the main reason why intense pain is relieved with morphine (§2.13.1). A significant feature of the analgesia is that it occurs without loss of consciousness. Thebaine (another alkaloid) is a powerful narcotic which induces sleep and makes a patient free of pain (§2.13.5). Papaverine also produces a light sleep since it slows the heart rate (§2.13.2). Narcotine has a depressant action and is also used as a hypnotic drug (§2.13.4).

Although sleep induction and intense pain-relief are the most prominent indications for the poppy, there are still many more indications. **Inflammation** was also treated with poppy (§2.5.3). Since papaverine promotes vasodilation, high bloodflow will decrease inflammation with larger blood supply to the affected areas (§2.13.2). In modern pharmacy, inflammation will not be treated with poppy because there are several anti-inflammatory drugs available which do not have as many side-effects as poppy. This non-treatment is also valid for the ancient treatment of sciatica and pains in the sides (§2.5.4).

Erisypelas was also treated (§2.5.4). Reisine *et al.* (1996:533) writes that therapeutic doses of morphine cause dilatation of cutaneous blood vessels, which activates the release of histamine. This results in an allergic reaction, in combination with pruritus and urticaria. Poppy would thus not be a good choice of drug in the treatment of erisypelas, since it would worsen the symptoms.

The ancients also used poppy for **toothache** (§2.5.2.1), **earache** (§2.5.2.2), **gout** (§2.5.2.6) and **ulcerations** (§2.5.2.7). The morphine in poppy remains the major drug for the treatment of moderate to severe pain but opioids are not indicated for types of pain which can be treated with a less severe drug like aspirin or a non-steroidal anti-inflammatory drug (Reisine *et al.* 1996:539).

Bladder pain (§2.5.2.3) and **difficult urination** was also treated with poppy (§2.5.2.4). Reisine *et al.* (1996:532) report that "morphine inhibits the urinary voiding reflex, and both the tone of the external sphincter and the volume of the bladder are increased". Urine flow decreases and the ureter may become spastic. This explains why poppy would definitely not relieve difficult urination, but intensify it. This would also result in more pain. It means that ancient doctors used poppy wrongly for this medical problem.

For **headaches** (§2.5.2.5), the ancients soaked bread in a poppy decoction. Pharmacologically it would not be effective since headaches are best treated with specific agents dependent on a specific etiology.

The ancients believed that **inflammation of the womb** (§2.5.3.2) was a very severe case. According to Celsus, they prepared a decoction of 5 ingredients and even gave warnings not to give it in the case of fever. Modern pharmacology describes the use

of opioid drugs for the uterus only in the case of labour. It is said that morphine can restore the tone of the uterus, frequency and the amplitude of contractions to normal. But it can increase neonatal mortality (Reisine *et al.* 1996:532). This means that no opioids will be prescribed for general pain in modern times. Opioids are only used for obstetrical analgesia (Reisine *et al.* 1996:540).

Colic is a very general pain today, but in antiquity the patients really suffered when they had colic. They even had a pill especially designed for colic, the pill of Cassius (§2.5.2.8). The morphine is also used today for this pain. Reisine *et al.* (1996:532) explains that morphine and the other μ agonists decrease the secretion of acid in the stomach and increase the tone of the stomach. Morphine also decreases secretions of the bile, pancreas and intestine and delays digestion of food. These actions help to relieve the intense pain of colic.

Pliny also writes that poppy **purges** the body "upwards and downwards" and in modern terms the "upward"-purging is true (§2.5.4). Scientifically we know that nausea and vomiting are side-effects of morphine-like drugs because it stimulates the chemoreceptor trigger zones for emesis (Reisine *et al.* 1996:531). The "downward"-purging is not true becauses morphine-like drugs cause constipation (§2.14).

Poppy was also used as a **suicide drug** for the old age (§2.5.4). This is indeed a valid indication since an overdose of poppy increases the respiratory depressant action, which increases the intracranial pressure as a result of retention of carbon-dioxide (CO_2) and subsequent cerebral vasodilatation until death (§2.14).

The effect of opioids when **diarrhoea** is treated, is very rapid and effective. This was also known in antiquity and it is still used today (§2.14). Morphine causes inattention to the normal sensory stimuli for the defecation reflex and an increased tone nearly to spasm. Propulsive peristaltic waves in the colon are diminished or even abolished. This results in a delay of faeces through the colon, which contributes to morphine-induce of constipation (Reisine *et al.* 1996:532).

More indications are known today. The effects explained are not the only indications, it is used for several more. Now we also know that codeine **suppresses the cough centre** (§2.13.3), that narcotine **calms down the motility of the gut** (§2.13.4) and

that papaverine is mainly used for **cardiac problems** (§2.13.2). It is only the morphine and thebaine that exert intense **narcotic properties** (§2.13.1 and 2.13.5). It is not mentioned that poppy would relieve **epilepsy, coeliac trouble or extracts bone splinters** out of the body (§2.5.4)

Sadly enough, the poppy has addictive properties. Heroin is one of the drugs which is a semi-synthetic opiate which has destructive effects on drug addicts. Thousands of people die every year of this addiction, not only because of frequent use, but because of increasing dependence on a greater amount of this drug every time they use it (§2.14.2). Tolerance and physical dependence are also not only because of street drugs. Addiction also occurs after prolonged use of opioids, especially morphine. This is a rather potent drug which can be successfully used in the treatment of intense pain (e.g. post-operative and pain due to terminal illness and cancer). "No patient should ever wish for death because of a physician's reluctance to use adequate amounts of effective opioids" (Reisine *et al.* 1996:539).

CHAPTER 3
MANDRAGORA OFFICINARUM L.

English – Mandragora, Circaeon, Satan's apple, European mandragora

Mandrake (*Mandragora* spp.) has been widely used as a drug since early antiquity, with the earliest known employment recorded on a cuneiform tablet dated 2000 BC The ancient Hebrews were well aware of its aphrodisiac, soporific and narcotic properties, and Theophrastus gave descriptions of mandrake's properties (*dynamics*) commonly assumed by his folk-medical informants, the semi-professional rootcutters (*rhizotomoi*). In his *Historia Plantarum*, 9.18, he warns that mandrake's root could cause madness, along with its properties as a narcotic, and he also tells of ordinary rituals and folk-beliefs associated with the gathering of *mandragora*. Non-medical texts likewise record mandrake as broadly known in classical antiquity. Later sources on mandrake include Apuleius of Madaura's *Metamorphoses* of *ca.* AD 160, Macrobius' Saturnalia (*ca.* AD 400), Isidore of Seville's Etymologiae of *ca.* AD 630, and a text we call Pseudo-Apuleius, the *Herbarium*, dated at about AD 650.

Mandrake is a poisonous, hallucinogenic plant. The word mandrake is a variation of the Greek *Mandragoritis*, an alternative name for Aphrodite (Holzman 1998:241). The plant also had a reputation as a love potion[85] and in the Old Testament it was employed as a fertility charm.[86] The most famous legend surrounding the plant, however, concerns the perils of uprooting it. When lifted from the earth, the mandrake would utter a piercing shriek that meant certain death, so an unfortunate dog was commonly entrusted with the task of pulling it up.[87] Mandrake is also well-known for another "property": it has been associated with magical practices and mysticism since the time of the early Egyptians and features prominently in folklore. It most probably owes this reputation to the fact that it contains scopolamine, which is a known hallucinogenic. The male plant was more robust and the female one more

85 Bible: Song of Songs 7:13.
86 Bible: Gen. 30:14 ff.
87 Flavius Josephus (37 –101 AD) was the first to give a warning against the poisonous effects of the plant in *The Jewish war* (7.180), written in AD 78.

delicate which is why mandrake's magical properties were often associated with the sexes (Lewis 1977:422).

If there were a true "Anaesthetic of Antiquity" it would have been mandragora. Our best and most detailed description of the pharmacological properties of mandragora occurs in the *De Materia Medica* of Pedanius Dioscorides, Book 4, section 75. Here one finds a good summary of its uses, occurrences, quantities to be administered, and effects – from wooziness to death – that the Roman *iatros* or *medicus* could expect, and it is most significant that Dioscorides specifically mentions that mandragora is an effective anesthetic. Supplementing Dioscorides' Greek text are the Latin works of Cornelius Celsus and Pliny the Elder, which confirm, supplement and amplify somewhat the more precise account by Dioscorides.

In the final part of this chapter a phytochemical and pharmacological analysis of mandrake will determine whether the wide applications and properties assigned to mandrake in ancient and modern writings are warranted.

3.1 MORPHOLOGY

Mandragora is a member of the *Solanaceae* family. The true mandragoras are in the genus *Mandragora* (especially *M. officinalis*), herbaceous perennials native to the Mediterranean and to Himalayan areas. Dioscorides describes the mandragora plant as follows: "One kind of this plant is female[88], the black one, called *thridacias*, having leaves narrower and smaller than the lettuce's, fetid and heavy in scent, streaming on the ground, and among them fruit resembling sorb apples, pale-green in colour, sweet smelling – containing seed like the pear's. The roots are sizeable, two or three entwined within each other, black on the surface but white inside, having a thick skin" (4.75.1). Pliny adds that the roots are reddish, fleshy and tender and almost a cubit in length (*H.N.* 25.147), while Dioscorides asserts that it has no stem (4.75.1). Pliny describes the stem as hairy (*H.N.* 25.147).

Dioscorides describes the leaves as follows:

[88] See also Plin. *H.N.* 25.147

"The leaves of the male, the white one, - which some called *morion* - are white, large, broad, and smooth like the leaves of the beet; its fruit is twice as large – saffron in color, and somewhat oppressively fragrant" (4.75.1).

Pliny tells us that when the seed is white, the plant is called arsen[89], morion or hippophlomos.

3.2 HARVESTING THE PLANT

Theophrastus says that one should draw three circles around mandragora, with a sword, and cut it while facing towards the west; at the cutting of the second piece one should dance round the plant and say as many things as possible about the mysteries of love (*H.P.* 9.8.8). Pliny gives the same description, but adds that the diggers avoid facing the wind (*H.N.* 25.148).

3.3 PROCESSING THE PLANT

According to Dioscorides (4.75.3), "Juice is extracted from the skin of the root when fresh by chopping it and putting it under a press. After it has been condensed, it must be stored in a clay vessel. Juice is extracted also from the fruit in a similar fashion, but the juice from the fruit becomes weak. The skin is also peeled from the root, threaded with a linen thread, and hung for later use. But some boil down the roots with wine until reduced to one third, strain, and store...".

Pliny agrees that the juice can be obtained from the fruit, the stem (after cutting off the top), and from the root, which is opened up by pricking it or boiled down to a decoction. Even the shoot of its root can be used, and the root is also cut into round slices and kept in wine. The juice has a strong smell, and smells even stronger when the juice comes from the root or from the fruit of the white mandragora (*H.N.* 25.148).

Pliny describes the drying process: "The ripe fruit is dried in the sun, and so is the root, which is crushed or boiled down to one third in dark (red) wine. The leaves are kept in brine, more effectively those of the white kind. The juices of the leaves that have been touched by dew are deadly and even when kept in brine they retain harmful properties" (*H.N.* 25.148).

---

[89] According to Jones, arsen means "male". Jones also remarks that Fée doesn't think that "*morion*" was mandragora, but *Atropa belladonna* (Plin. *H.N.* Vol. 7 p 241).

Theophrastus says that the rootcutters prepared the roots for use by cutting the sliced roots into pastilles just as they did with radishes, and then strung them up to hang over smoky must until they were soft (*H.P.* 9.9.1).

Dioscorides gives the following recipe for wine flavoured with mandragora (*Oinos Mandragorites*): "Cut into pieces the skin of its root, thread half a *mna*[90] with a linen thread, and place it into one *metretes*[91] of must for three months, then decant. The average potion is one half *cotyle*;[92] however, twice this quantity is drunk when grape syrup is added" (5.71).

3.4 ADMINISTRATION OF THE DRUG

The main authors all give advice on how to administer the mandragora drug. Dioscorides writes: "It is compounded with emollient pessaries; about one *hemiobolon*[93] inserted by itself as a pessary, and when placed in the anus as suppository, it is soporific... The leaves, when new, are suitable plasters" (5.71). Celsus tells us that consuming a piece of white bread which has been soaked in a mix of mandragora and wine[94] will also induce sleep and dissolved in water and taken orally it could be used as a painkiller:

"ex eo paululum aut devoratur, aut aqua diluiter et potui daturi" (5.25).

Dioscorides refers to administration by inhalation and the use of a clyster (5.71) while Theophrastus shows a preference for administering mandragora in a mixture of wine or vinegar; after it has been prepared as described (*H.P.* 9.9.1) i.e. cut into little balls and strung up in smoke over must (*H.P.* 9.9.1) as part of inhalation therapy. This method will later be discussed in greater detail.

3.4.1 MANDRAGORA USED IN COMBINATION WITH WINE

Wine with mandragora as an ingredient constituted a general anaesthetic with great potency. Dioscorides warns that old wines of this kind are harmful to the nerves and to the other sense organs. For this reason; people who have some "weak area"

---

90 436.6 g
91 39.360 litres
92 0.137 litres
93 0.33 g
94 "*candidi panis interiorem partem ex vino subactam*" (Cels. 6.6.1).

should abstain from drinking this wine although the taste might be pleasant (5.71). "It causes drunkenness and all drunkenness is dangerous... but drinking moderate amounts of mandragora wine for a few days is beneficial and especially if one drinks water first" (5.71). Dioscorides describes how the wine made from mandragora produces anaesthesia and this is the first time that he uses the word "anaesthesia" to indicate "absence of sensation", the meaning we generally attach to the word today. When used in moderate quantities it caused sleep and was also used to induce anaesthesia, but the wine was lethal when too much was consumed.

Although he does not provide a recipe or mention any effects, Pliny likewise refers to wine made from mandragora (*H.N.* 14.111).

3.5 EFFECTS

3.5.1 SLEEP AND ANAESTHESIA

It seems that mandragora was a general type of medication used for a wide variety of illnesses and complaints, but that it was most commonly used as soporific and for the relief of pain. Dioscorides says: "...administering about one *cyathos* to insomniacs, to those in much pain, and to those undergoing surgery or cauterisation whom they wish to anesthetise... and when placed in the anus as suppository, it is soporific..." (4.75.3).[95]

Dioscorides gives the following warning about mandragora wine: "It is soporific and it plunges an entire dinner party into deep sleep if one *cotyle*[96] of it was mixed with one *chous*[97] of wine; one *cyathos*[98] drunk with one *xestes*[99] of wine is lethal. Its moderate use however, allays pain and thickens discharges. Both, when smelled and when used as a clyster it does the same" (5.71).

---

95 For non-medical references to mandragora as a soporific, see Frontinus (*Strategems* 2.5.12), Plato (*Republicae* 488.C) and Apuleius (*Metamorphoses* 10.11).
96 0.274 litres
97 3.282 litres
98 0.0456 litres
99 0.547 litres

According to Dioscorides the deep sleep caused by mandragora made patients insensible to pain, especially when they had eaten or smelled its fruit or had consumed excessive quantities of the juice. Another side-effect was loss of speech (4.75.3-7).

Dioscorides also writes about *morion*[100]..."they say that it stupefies when as much as one drachma is drunk or when eaten in a lump of barley or in prepared food; for the person falls asleep in whatever posture he was when he ate it, feeling nothing for three or four hours from the time it was offered to him. Physicians about to perform surgery or cautery use this one too" (4.75.3-7).

Pliny the Elder and his sources concur with Dioscordes on the soporific and anaesthetic effects of mandragora:

"*Gravedinem adferunt etiam olfactu, quamquam male in aliquis terris manduntur, nimio tamen odore obmutescunt ignari, potu quidem largiore etiam moriuntur. Vis somnifica pro viribus bibentium. Media potio cyathi unius. Bibitur et contra serpentes et ante sectiones punctionesque, ne setiantur. Ob haec satis est aliquis somnum odore quaesisse. Bibitur et pro helleboro duobus obolis*[101] *in mulso – efficacius helleborum – ad vomitiones et ad bilem nigram extrahendam*" (*H.N.* 25.149).

"The mere smell brings heaviness of the head and – although in certain countries the fruit is eaten – those who in ignorance smell too much are struck dumb, while too copious a draught even brings death. When the mandragora is used as a sleeping draught the quantity administered should be proportioned to the strength (resistance) of the patient, a moderate dose being one *cyathus*. It is also taken in drink for snake bite, and before surgical operations and punctures to produce anaesthesia. For this purpose some find it enough to put themselves to sleep by the smell. A dose of two *oboli* of mandragora is also taken in honey wine instead of hellebore – but hellebore is more efficacious – as an emetic and to purge away black bile".

The information obtained from Theophrastus confirms the use of mandragora's use as soporific: "...for the leaf of this, they say, used with meal, is useful for sleeplessness" (*H.P.* 9.9.1).

---

100 See §3.2

101 An ancient unit of weight equal to one sixth of a drachma i.e. 0,568 g

Elsewhere Theophrastus writes "Some instead cause derangement, like the root resembling golden thistle and some other roots, some are soporific and when taken in large quantities even fatal, like mandragora..." (*De Causis plantarum* 6.4.5).

Another author who mentions the narcotic effects of mandragora is Isidore of Seville, a 5th century author from Spain. He wrote:

"Mixed with wine, the root-bark of the mandragora is given to those whose bodies are to be cured by surgery, so that with the sleeping-drug, they will feel no pain" (Isidore of Seville *Etymologiae* 17.30) [trans. Scarborough 2006:7].

3.5.1.1 Mandragora used in recipes

Recipe 1

Since mandragora was known as a true narcotic, it was not only included in sleeping potions, but also in pain relieving decoctions. Celsus writes:

*"Sive autem capitis dolores sive ulcera sive lippitudo sive dentes...sive spiritus difficultas sive intestinorum tormenta sive inflammatio vulvae est, sive coxa sive iecur aut lienis aut latus torquet, sive vitio locorum aliqua prolabitur et ommutescit, occurrit dolori per quietem eiusmodi catapotium: silis, acori, rutae silvestris seminis, singulorum P. * I; castorei, cinnamomi, singulorum P. * II; papaveris lacrimae, panacis radicis, mandragorae malorum aridorum, iunci rotundi floris, singulorum P. * II = -; piperis grana LVI. Haec per se contrita, rursus instillato subinde passo, simul omnia teruntur, donec crassitudo sordium fiat. Ex eo paululum aut devoratur, aut aqua diluitur et potui datur" (5.25.3).*

"But whether there is headache or ulceration or ophthalmia or toothache or difficulty in breathing or intestinal gripings or inflammation of the womb or pain in the hips or liver or spleen or ribs, or, whether owing to genital trouble, a woman collapses speechless, a pill of the following kind counteracts pain by producing sleep: saxifrage, sweet flag, wild rue seed, 4 grms. each, castory and cinnamon 8 grms., poppy tears, panax root, dried mandragora apples, flowers of the round rush, 9 grms. each, and 56 peppercorns. These are first pounded separately, then rubbed up all together, whilst gradually adding raisin wine until the mixture is of the consistency of sordes. A small quantity is either swallowed or dissolved in water and taken as a draught".

Recipe 2

Celsus also recommended the following mixture to ensure better sleep:

*"Aliud ad idem: murrae P. * -; mandragorae suci P. * I; papaveris lacrimae P. * II; foliorum rosae, cicutae seminis, singulorum P. * III; acaciae P. * IIII; cummis P. * VIII. Et haec quidem interdiu: nocte vero, quo commodior quies veniat, non alienum est superinponere candidi panis interiorem partem ex vino subactam" (6.6.1.I).*

"Another composition having the same efficacy is made up of: myrrh 0.33 grms., mandragora juice 4 grms.; poppy-tears 8 grms.; rose leaves and hemlock seeds 12 grms. each; acacia 16 grms.; gum 32 grms. These applications are made by day; at night, in order better to assure sleep, it is not inappropriate to apply above the eye, the crumb of white bread soaked in wine".

3.5.2 GENERAL PAIN

Celsus maintains that mandragora is an effective cure for headache, ulceration, ophthalmia, toothache, difficulty in breathing, intestinal gripings (cramps), inflammation of the womb, pain in the hips, liver, spleen or ribs. When, owing to genital trouble, a woman collapsed speechless, he also regarded the mandragora mix as an effective sedative:

"S*ive autem capitis dolores sive ulcera sive lippitudo sive dentes...sive spiritus difficultas sive intestinorum tormenta sive inflammatio vulvae est, sive vitio locorum aliqua prolabitur et ommutescit, occurit dolori per quietum eiusmodi catapotium*" (5.25).

Pliny thought that pounded mandragora leaves would relieve pain in the sinews running across the shoulder blades, backbone and loins.[102]

3.5.3 ARTHRITIS, PAIN IN THE JOINTS, GOUT

In antiquity pain in the joints was quite a general complaint, as everybody had to walk where they wanted to be and wear and tear of the joints eventually led to unbearable pain. Fortunately the ancient doctors and herbalists had remedies to ease these pains. Dioscorides recommends a mixture of mandragora and barley groats and

---

[102] Plin. *H.N.* 26.105

maintains that it will put an end to pains in the joints if a dose of three *cyathoi* [103] is given (4.75.3-7). Pliny also prescribes mandragora mixtures for pain in the joints, [104] a cure specified 300 years previously by Theophrastus who wrote:

"...such as mandragora; for the leaf of this, they say, used with meal, is useful when scraped and steeped in vinegar, and also for gout" (*H.P.* 9.9.1). The ancients especially scraped the mandragora root, peeled it and soaked it in vinegar. Apparently this was effectively used for treating gouty conditions. (*H.P.* 9.9.1). Pliny also prescribed the pounded mandragora leaves to relieve gout.[105]

3.5.4 INFLAMMATION

Dioscorides regarded new leaves prepared with barley groats, as suitable plasters both for inflammation of the eyes and for inflammations of sores (5.71).

3.5.5 EYE MEDICATION

According to Dioscorides mandragora was compounded with ophthalmic and analgesic medications (5.71) and Pliny also prescribed mandragora as eye medicine.[106]

Celsus agrees that mandragora ointment is very effective as medication for the eyes and adds that one should apply it above the eye in case of infection:

"*...superinungui vero oculi debent...quo commodior quies veniat, non alienum est superinponere*" (6.6.1).

3.5.6 PURGE

Dioscorides prescribes a quantity of two *obols*[107] of mandragora juice drunk with hydromel to bring up phlegm and bile in the same way that hellebore does (5.71).

---

103 0,0456 litres
104 Plin. *H.N.* 26.104
105 Plin. *H.N.* 26.103
106 Plin. *H.N.* 25.147
107 1.136 g

3.5.7 ABORTIFACIENT

Dioscorides supplies the exact dosage of mandragora when it is to be used as an abortifacient. He writes that about one *hemiobolon* inserted by itself as a pessary, draws down the menstrual period and clears the womb of afterbirth (5.71).

The seed of the fruit cleanses the uterus when drunk and it stops the red discharge when inserted with native sulfur (Diosc. 4.75.3-7). Pliny adds that the mandragora seed is taken in a drink to purge the uterus and a pessary of its juice is an emmenagogue and aborts a dead fetus.[108]

3.5.8 DERMATOLOGY

Dioscorides says that mandragora dissipates all indurations and abscesses, scrofulous swellings of the glands and growths. When gently rubbed on for five or six days it erases blemishes without ulceration (5.71). He adds that a direct application of the leaves is a cure for the same ailments (Diosc. 5.71).

Dioscorides writes that the root, grounded up with vinegar, cures erysipelas.[109] It is good with either honey or oil for strokes (i.e. bites) of reptiles and with water it disperses scrofulous growths and tumors (4.75.3-7). Theophrastus adds that sliced mandragora roots[110] or the peeled root, soaked in vinegar is good for treating erysipelas (*H.P.* 9.9.1).

Pliny agrees that a decoction of the root in wine is beneficial for scrofulous sores[111] and superficial abscesses, [112] and adds that it can be used to remove anything that is embedded in the flesh.[113] He prescribes fresh leaves for abscesses and foul ulcers.[114] According to Theophrastus the leaf of the mandragora used with meal, is useful for wounds (*H.P.* 9.9.1).

---

108 Plin. *H.N.* 26.156

109 Erysipelas (Greek ερυσίπελας - *red skin*). A superficial cellulitis caused by Group A β-hemolytic streptococci (Berkow *et al.* 1987:2265).

110 Plin. *H.N.* 26.121

111 Plin. *H.N.* 26.24

112 Plin. *H.N.* 26.93

113 Plin. *H.N.* 26.149

114 Plin. *H.N.* 26.145

3.6 TOXICITY

3.6.1 LETHAL EFFECT

Dioscorides not only wrote about the medicinal effects of mandragora, but he also knew the lethal doses (more than two *cyathus*) which could kill a person (5.71).

Theophrastus knew that plants which grew in different localities had different effects. He writes:

"...of those that are sweet there are some that cause mental derangement (like mandragora), as the plant like the golden thistle which grows near Tegea: of this Pandeios the sculptor ate, and went mad while he was working in the temple. Others have fatal effects, as that which grows near the mines in the fields of Thrace: this however is inoffensive and quite sweet to the taste, and the death which it causes is easy and like falling asleep" (*H.P.* 9.13.4).

3.6.2 ANCIENT ANTIDOTE

The only author who suggests an antidote to mandragora, is Dioscorides and this is probably due to the knowledge he obtained as an pharmacologist. Dioscorides writes: "They say that the root is also an antidote when drunk with thorn apple" (4.75.3-7).

MODERN MANDRAGORA

Magical properties have been attributed to the mandragora because of its monstrous shape. It is widely known for its powerful magical properties (positive and negative) since time immemorial. It is the most celebrated of all "magical" plants in history and has given rise to an enormous amount of literature. Due to its ancient reputation of shrieking and its likeness to the human form, it became a popular topic with a romantic twist. It features in Shakespearian plays, and more recently in one of the popular Harry Potter books.[115] References to mandragora also occur in the lyrics of songs performed by Iron Maiden, Deep Purple and Edguy and in the scripts of

[115] Rowling, J. K. 1998. *Harry Potter and the chamber of secrets.* London: Bloomsbury.

movies such as "The Saga of the Icepeople", "Dr. Strangelove", "How I Learned to Stop Worrying", "Love the Bomb" and in "Pan's Labyrinth".

3.7 MORPHOLOGY

According to Grieve[116] (1931:510) the plant has a large, brown root (almost like parsnip), running about 1,2 metres deep into the ground, sometimes single and sometimes divided into two or three branches. The roots of mandragora and belladonna are very similar, both in external appearance and in structure.

From the crown of the root several large, dark-green leaves arise which at first stand erect but when the plant is fully grown (about 30 cm), the leaves spread open and lie upon the ground. The leaves are sharppointed at the apex with a foetid odour. Among the leaves spring the flowers, each from a separate foot stalk, and grow to between 7.5 cm and 10 cm high. The flowers have the shape and size of primrose, the corolla bell-shaped, cut into five spreading segments of a whitish colour, somewhat tinged with purple. They are succeeded by a smooth round fruit, about as large as a small apple, which has a deep yellow colour when it is ripe. The fruit is full of pulp, with a strong, apple-like scent.

3.8 DISTRIBUTION

The plant is a native of temperate Eurasia, but it also grows in gardens if it is suitably warm. It may not survive cold winters (Grieve 1931:510).

3.9 PROCESSING

From Grieve's modern work on botany we learn that the leaves are harmless and cooling, and have been used in ointments and other external applications. Boiled in milk and used as a poultice, they are applied to indolent ulcers. The fresh root operates powerfully as an emetic and purgative. The dried root was also employed in the beginning of the 19th century as a very drastic purge (Grieve 1931:511).

---

[116] Grieve is an old reference. Due to the fact that *Mandragoras officinarum* L. is not used in modern pharmaceutics anymore, it was not possible to find a more recent reference.

3.10 ADMINISTRATION

A tincture made from the fresh plant, is still used in homoeopathy today (Grieve 1931:511).

3.11 PHYTOCHEMISTRY

Today mandragora is an almost forgotten plant since it is no longer used in medicine. *Mandragoras officinarum* belongs to the *Solanaceae* family of plants and contains 0,3 – 4% of tropane-based alkaloids.

The tropane-based alkaloids were prominent in significant folklore where extracts of mandragora were used. The alkaloids in mandragora are hyoscyamine $C_{17}H_{23}O_3N$ (scopoletin 2500 – 3500 ppm), hyoscine $C_{17}H_{21}O_4N$ (scopolamine 30 – 50 ppm), atropine $C_{17}H_{23}O_3N$ (10 – 20 ppm) and small quantities of mandragorine[117] ($C_{17}H_{27}O_3N$) that is only found in the root. Tropane alkaloids (3,6-ditigloxytropane) are esters of various tropic acids and derivatives of pyrrolidine-piperidine alkaloids.

3.11.1 ATROPINE (*DL*-HYOSCYAMINE)

The highest atropine level is found in the roots of samples. Scopolamine and hyoscyamine was found in the leaves, whole surface parts, roots, rhizomes and the seed of the plant (Razzakov *et al.*1998:742).

Atropine is chemically known as α-(hydroxymethyl)benzene-acetic acid (3-endo)-8-methyl-8-azabicyclo[3.2.1]oct-3-yl ester. Atropine can also be written as

1αH, 5αH-tropan-3α-ol. $C_{17}H_{23}NO_3$ with a molecular weight of 289.37. The different persentages of elements in the carbon chain are C = 70.56%, H = 8.01%, N = 4.84% and O = 16.59%.

Long orthorhombic prisms form from acetone. Atropine has a melting point of between 114 and 116°C (Budevari 2001:151).

---

[117] Ramoutsaki *et al.* 2002:336

3.11.2 HYOSCYAMINE (*L*-HYOSCYAMINE)

Hyoscyamine is also chemically known as α-(hydroxymethyl) benzene-acetic acid (3-endo)-8-methyl-8-azabicyclo[3.2.1]oct-3-yl ester. Hyoscyamine can also be written as 1α*H*, 5α*H*-tropan-3α-ol. $C_{17}H_{23}NO_3$ with a molecular weight of 289.37. The different percentages of elements in the carbon chain are C = 70.56%, H = 8.01%, N = 4.84% and O = 16.59%.

The description of hyoscyamine is exactly the same as that of atropine. The only difference is in the *dl*-hyoscyamine and the *l*-hyoscyamine. The atropine can be seen as the racemic and the *dl*-hyoscyamine and the *l*-hyoscyamine as the optic pure product.

Silky, tetragonal needles form from evaporating alcohol. It should be kept well closed and protected from light and heat since it can be easily racemised. The melting point differs little from that of atropine, being 108.5° with a pKa of 9.7. Hyoscyamine is freely soluble in alcohol (Budevari 2001:870).

3.12 PHARMACOLOGY

A prominent feature of the tropane alkaloids is their ability to produce hallucinations[118] and delirium.[119] The alkaloids act as vasodilators[120] and are used in cough medicines to open the bronchi. Hay fever is cured by the vasodilating (opening) of the vessels as well as the respiratory system. Nasal and sinus secretions caused by allergies and colds are also decreased.

High doses of atropine and hyoscyamine are central acting and strong antagonists (muscarinic acetylcholine receptors). They lead to repression of respiration, coma from the stimulation of the cerebrum, midbrain and medulla oblongata. It inhibits smooth muscle and is classified as a spasmoliticum that leads to hallucinogenic activity in the central nervous system.[121] They are also anticholinergic agents which

---

118 Holleman 1998:229
119 Hoffmann 2003:123
120 Scarborough 2002:187
121 Brown *et al.* 1996:160

produce hallucinogenic effects as well.[122] Atropine suppresses salivation and is used during anaesthesia to reduce secretions.[123]

The atropine causes dilatation of the pupil of the eye since mydriatic alkaloids[124] help prevent adhesions between the iris and lens of the eye during iritis. In high doses hyoscine affects memory and central respiratory depression during anaesthesia. Hyoscine (scopolamine) prevents motion sickness. It remains a significant premedication administered before surgery under general Anaesthesia as it arrests salivary and mucuous secretions (Humphrey et al 2001:3).

Hyoscyamine also controls abdominal and visceral cramps, gastric secretions during peptic ulcer therapy, hypermotility in spastic colitis.[125]

3.13 TOXICITY

When too much mandragora is consumed, side effects potentiate until the whole human system becomes contaminated. This is due to the anticholinergic effects which leads to a dry mouth and rapid heart beat. Skin rash, flushing, painful urination, blurred vision and light sensitivity are also symptoms that can occur during the use of atropine.[126]

3.13.1 MANDRAGORA VERSUS MANDRAX

Mandragora is often confused with mandrax. According to Charles Parry of the South African Medical Research Council, (2008:01), South Africa is the largest abuser of Mandrax in the world. Statistics show that Mandrax with Dagga (*Cannabis sativa* L.) is still the drug of preference all over South Africa. Mandrax is mainly sold in the form of a tablet and is highly addictive.

Mandrax is a synthetic drug that is manufactured and produced in the form of a tablet. The active ingredient in Mandrax is Methaqualone, also known as 3,4-dihydro-2-methyl-4-oxo-3-o-tolylquinazoline, 2-methyl-3-(2-methylphenyl)-4- (3H)-quinazolinone, Metholquizolone, QZ-2, 2-Methyl-3-o-tolyl-4(3H)-quinazolinone, RIC-272, TR-

---

122 Holleman 1998:233
123 Hoffmann 2003:123
124 Brown *et al.* 1996 :151
125 Harbone *et al.* 1993: 229
126 Hoffmann 2003:123

495 and Quaalude. From this description it is clear that mandrax is a synthetic drug and not a medicinal plant like mandragora.

3.14 CONCLUSION

Throughout the long history of botany and pain relief, mandragora has been used as an effective anodyne, soporific, narcotic and hallucinogenic agent.

The ancient **morphology** (§3.1) of the plant correlates with modern descriptions. Both descriptions define the leaves as large, lying on the ground and giving off a very peculiar smell. The fruit resembles small apples with a deep yellow colour.

In the modern morphology, nothing is mentioned about a "black" and "white" plant, or even the difference between male and female plants as we find in the ancient morphology. There is a probability that the ancient rootcutters got confused with other plants, especially because the synonym for *Withania somniferum* is the "white seeded mandragora" (§3.7).[127]

Its **distribution** is more or less the same in ancient and modern times, which proves that the plant has not evolved much and still prefers a moderate Mediterranean climate (§3.8).

In order to **process** the drug, the ancients extracted the juice from the bark of the root, fruit and stem. They also sliced the root, strung it and hung it over smokey must to inhale the smoke. They dried the ripe fruit and preserved the leaves in brine. The ancients also made a wine which was flavoured with mandragora as a general anesthetic (§3.3). Mandragora is no longer used in pharmaceutical practice today but according to modern literature the leaves can be used fresh as a plaster, or boiled in milk to use as a poultice while the fresh and dried root can be employed as a purge (§3.3). According to an older edition of Grieve, homeopaths use a tincture of the fresh plant (§3.10).

Towards the Middle Ages its magical properties seem to have been highlighted although it was still regarded as a sedative and fertility enhancer.

---

[127] See Chapter 8, p 140.

The most important property which the ancients ascribed to mandragora was its ability to **induce a deep sleep and to relieve pain**. Dioscorides administered it to people who suffered from insomnia, intense pain, and to those who needed surgery, for they became insensible to pain (§3.5.1). This effect is valid, since hyoscine normally causes central nervous system depression, which leads to drowsiness, fatigue and a dreamless sleep. Hyoscyamine in combination with atropine leads to coma and hallucinogenic activity due to the inhibition of smooth muscles. Atropine is administered as premedication before surgery, as it suppresses salivation (§3.12).

The ancients also used mandragora for **arthritis, pain in the joints** (§3.5.3) and **inflammation** (§3.5.4). Atropine and hyoscyamine are muscarinic acetylcholine receptors and act as vasodilators. The atropine increases smooth muscle tonus and hyoscyamine also controls visceral and abdominal cramps. It is therefore suitable to prescribe mandragora for arthritis, inflammation and pain in the joints (§3.12).

Mandragora was used by Celsus and noted by Pliny as an **eye medication** (§3.5.5), especially to clear up infections. Atropine is very useful in eye conditions, since it dilates the pupil and paralyzes accommodation (Brown *et al.* 1996:151). It is not really possible to treat infection without an antibiotic drug, but with the dilation of the pupil, the intra-ocular pressure would be less, which in turn will reduce the pain (§3.12).

When the effects of atropine, hyoscine and hyoscyamine are studied, it becomes clear that it can be used in a modern way in flu-mixes because it is a vasodilator that opens the bronchi, especially in cases of asthma and to relieve coughs. In antiquity the use in these cases was not written down, thus it is not known (§3.12). According to the pharmacology however, its use as an enhancer of fertility is not proven, unless improved blood flow to the reproductive system is considered conducive to conception.

Mandragora is not used in modern pharmaceutics any more but chemical drugs are available which include the active ingredients also found in mandragora, such as hyoscyamine and scopolamine.[128] These active ingredients are still used to induce sleep and as a narcotic before surgery, producing unconsciousness and indifference to pain. It is also used as an antispasmodic, an emetic, and an antidote for

---

[128] Van Wyk *et al.* 2004:416

snakebites. Before eye surgery it is used to enlarge the pupil (mydriatic effect), and it is valuable in the treatment of asthma, hay fever and coughs. Dermatological properties, the inducement of abortion and the purging effects mentioned in the ancient sources are not ascribed to mandragora in modern descriptions, which indicates that these effects were probably due to the properties of other ingredients in the mixture (§3.12).

While the ancients determined through experimentation and through trial and error that mandragora is an effective anodyne, soporific, narcotic and hallucinogenic agent, modern pharmacological analysis scientifically proves the properties for which it has been known throughout the long history of botany and pain relief. Its distribution is more or less the same in ancient and modern times, which proves that the plant has not evolved much and still prefers a moderate Mediterranean climate.

CHAPTER 4
HYOSCYAMUS NIGER L.

English – Hyoscyamus, Henblain, Stinking nightshade, Swinebean, Henbane

Afrikaans – Dolkruid, Bilsekruid

French – Jusquiame noire

German – Bilsenkraut

Italian – Giusquiamo nero

Spanish – Veleño negro

Hyoscyamus belongs to the family, *Solanaceae,* indigenous to Eurasia, but now cosmopolitan. According to Dioscorides, hyoscyamus was known by different names. Some herbalists also called it *adamanta* (4.68.1).

Pliny confirms the fact that the plant was known by more than one name.

"*Herculi eam quoque adscribunt quae apollinaris apud alios, apud nos altercum, apud Graecos vero hyoscyamos appellatur*" (*H.N.* 25.35).

"To Hercules too they ascribe the plant which is called *apollinaris* by some, *altercum* by us Romans, but by the Greeks *hyoscyamos* ("pig's bean")".

Roman veterinary traditions also incorporate hyoscyamus, employed as seeds mixed into fodder for treatment of blood blisters and edemas in the ankles and feet of horses and mules (Columella, *Rei rusticae* 6.38.3).

This hallucinogenic plant, together with mandrake and deadly nightshade were the main ingredients of the witches' brews of medieval Europe producing visual hallucinations and flights of fancy (Schultes *et al.* 1979:81, Lewis 1977:402).

Henbane has been known and feared since antiquity, especially after the black species had been identified and had become known as the most dangerous. The Egyptians documented their knowledge of these insanity-inducing plants in the Ebers Papyrus (1500 BC) (Schultes *et al.* 1979:86). Henbane was known as an excellent

pain-killer. It was used to dull the pain of those who were tortured and sentenced to death, not only to relieve the physical pain, but also to make them oblivious to reality (Schultes *et al.* 1979:87). Perry (1980:01) adds that the ancients regarded its narcotic effect as extremely potent. It was believed that even washing one's feet in it would induce sleep. The properties continue to be valued in modern times as illustrated by the use of *H. muticus* L. (Egyptian henbane), smoked in India for its intoxicating effects. It is usually mixed with *Cannabis sativa* L. (hemp) for a more inebriant feeling (Schultes *et al.* 1979:88).

4.1 MORPHOLOGY

Different species are found:

1. *Hyoscyamus niger* L. – Black henbane
2. *Hyoscyamus alba* L. – White henbane
3. *Hyoscyamus muticus* L. – Egyptian henbane

Likely employing some common written texts, Pliny and Dioscorides provide similar descriptions of the different species:

SPECIES	PLINY	DIOSCORIDES	MODERN
H. niger L.	Black seed Purple flowers Thorny calyx	Black seed Purple flowers Hard, thorny calyx Leaves like bindweed	Black hyoscyamus
H. muticans L.	Common kind Whiter Bushy	Quince-yellow flowers Soft leaves and capsules	Egyptian hyoscyamus
H. alba L.	Soft, downy Rich in juice White seed that changes to red Medicinal species	White flowers and white seed Highly medicinal uses	White hyoscyamus

Pliny gives the following description of the plant and its different varieties:

"*Plura eius genera: unum nigro semine, floribus paene purpureis, spinoso calyce; nascitur in Galatia. Vulgare autem candidius est et fruticosius, altius papavere. Tertii semen irionis semini simile, sed omnia insaniam gignentia capitisque vertigines*".

" *Quartum genus molle, lanuginosum, pinguius ceteris, candidi seminis, in maritimis nascens. Hoc recepere medici, item rufi seminis. Nonnumquam autem candidum rufescit, si non ematuruit, inprobaturque, et alioqui nullum nisi cum inaruit legitur...*"

"*Utuntur et radice, temeraria in totum, ut arbitror, medicina*". (25.35-37).

"There are several kinds of it: one has black seed, with flowers that are almost purple, and a thorny calyx, growing in Galatia. The common kind, however, is whiter and bushier; it is taller than the poppy. The seed of the third kind is like the seed of iris; but all kinds cause insanity and giddiness. A fourth kind is soft, downy, richer in juice than the others, with a white seed, and growing in places near the sea. This is a kind that medical men have adopted, as they have that with a red seed. Sometimes, however, the white seed turns red if gathered before getting ripe, and then it is rejected; and generally no kind is ever gathered before it has become dry. ".

Dioscorides' description of hyoscyamus (4.68.1) shows a remarkable resemblance to that of Van Wyk and Wink (2004:174). The similarity of properties leaves little doubt that the plant described in the ancient text is the same plant which is found in modern times.

Beck translates Dioscorides' description of the plant's outward appearance as follows (2005:276):

"It is a shrub that sends out thick stems and its leaves are wide, oblong, split, dark and rough. The flowers, which are fenced in with little disks, grow on the stem in a row, just like the flowers of the pomegranate; they are full of seed like that of opium poppy. There are three kinds of this plant: for one kind has somewhat purple flowers, leaves like bindweed, black seed, and the calyces are hard and thorny; another has quince-yellow flowers, softer leaves and capsules, and yellowish seed like hedge-mustard" (Diosc. 4.68.1).

Dioscorides' makes a clear distinction between the different kinds of hyoscyamus:

"Both these plants cause madness and are soporific; they are difficult to use. But the third one is highly useful for treatments, being very mild, fatty, soft and downy, and having white flowers and white seed; it grows by the sea and among ruins.

Therefore, it is the one with the white seed that must be used[129]; if this kind is unavailable, then the kind with the yellow seed must be used, but the hyoscyamus with black seed [130] must be rejected as being the worst" (4.68.2).

4.2 PROCESSING OF THE PLANT

According to Pliny the juice was obtained from different plant parts, especially the stem, leaves and seeds.

"Usus seminis et per se et suco expresso. Exprimitur separatim et caulibus foliisque. Utuntur et radice, temeraria in totum, ut arbitror, medicina" (*H.N.* 25.36).

"Use is made of the seed as it is or when the juice has been extracted from it. The juice is extracted separately also from the stems and leaves. They also use the root, but the drug is in my opinion, a dangerous medicine in any form".

Similarly Dioscorides describes the methods by which the juice was obtained:

"Different processes were used to extract the juice from the soft fruit, leaves and stems. They are brayed,[131] pressed, and then the liquid is dried in the sun. It is good for one year because it spoils easily" (4.68.2).

"...but juice is also extracted separately from the seed, which is brayed when dry, doused with hot water, and squeezed" (4.68.3).

Dioscorides describes how the first green shoots are pounded and mixed with fresh flour, shaped into little pastilles and stored (4.68.3).

4.3 ADMINISTRATION OF THE DRUG

Pliny's description of the preparation of hyoscyamus provides us with an indication of how its medicinal properties were made available. According to him the drug was administered to the patient in different forms. A mixture of hyoscyamus, mixed with

---

129 *Hyoscyamus alba* L.
130 *Hyoscyamus niger* L.
131 To reduce something to small pieces or particles by pounding.

poppy and hydromel was taken orally, while an anodyne plaster made of either the moulded leaves or fresh leaves, soaked in wine was put on the body for absorption through the skin. Hyoscyamus was also absorbed through the rectal mucous membranes after insertion of a suppository concocted from hyoscyamus juice. Oil, obtained from the juice, was dropped into the ears. Pliny warns that the leaves which were apparently taken in a drink would affect the brain (*H.N.* 25.36).

Celsus' warning not to swallow the following mixture indicates that this mixture was applied locally. Since it was made up of hyoscyamus, poppy and mandrake, it was a dangerous concoction. The mixture was used as a local anodyne and placed directly on the aching teeth. It was also used as a mouthwash.

"*Cuius rei causa et quinquefolii radix in vino mixto coquitur, et hyoscyami radix vel in posca vel in vino, sic ut paulum his salis adiciatur et papaveris non nimium aridi cortices et mandragorae radix eodem modo. Sed in his tribus utique vitandum est, ne, quod haustum erit, devoretur*" (6.9.2).

"For this purpose cinquefoil root may be boiled in diluted wine, and hyoscyamus root either in vinegar and water, or in wine, with the addition of a little salt, also poppy head skins not too dry and mandragora root in the same condition. But with these three ingredients, the patient should carefully avoid swallowing the fluid in the mouth" [trans. Spencer, Vol. 2 p. 247; slightly modified].

Pliny likewise recommends the chewing of the roots to relieve tooth ache.

"*Dentibus remedio sunt panacis radix commanducata, praecipue chironiae, item sucus collutis, radix hyoscyami ex aceto manducata, item polemoniae*" (*H.N.* 25.165).

"For the teeth remedies are: chewed root of panaces[132], chewed root of chironia especially, the juice too if the teeth be rinsed with it, the root of hyoscyamus chewed with vinegar, and that of polemonia"[133].

When used as a cough remedy Pliny recommends both the juice, taken orally, and inhalation of the fumes given off by the burnt leaves.

---

132 §156.
133 *Polemonium viscosum* L.

"*In pectoris vitiis vel gravissimum est tussis. Huic medetur panacis radix in vino dulci, sucus hyoscyami – etiam sanguinem excreantibus, nidor quoque accensi tussientibus*" (*H.N.* 26.27).

"Of chest complaints quite the most distressing is cough. Remedies for it are: root of panaces taken in sweet wine, juice of hyoscyamus (even when there is spitting of blood); the fumes too of burning hyoscyamus help the cough".

4.4 EFFECTS

The following extracts from the texts of the ancient authors illustrate that hyoscyamus was prescribed for a great variety of ailments. Not only was it effective as sleep inducing drug, but also as anodyne; perhaps even as anaesthetic.

4.4.1 SLEEP INDUCEMENT AND HALLUCINOGENIC

Pliny and his sources have little doubt about the effects of the plant. This is a hallucinogenic plant that induces sleep, but which can cause the patient to become confused. The fact that antidotes have been devised leads Pliny to regard the drug as a poison, but also a very useful drug, when used in moderate doses.

"*Quippe etiam foliis constat mentem corrumpi, si plura quam quattuor bibant; bibebant etiam antiqui in vino febrim depelli arbitrantes. Oleum fit ex semine, ut diximus, quod ipsum auribus infusum temptat mentem, mireque ut contra venenum remedia prodidere iis qui id bibissent et ipsum pro remediis, adeo nullo omnia experiendi fine ut cogerent etiam venena prodesse*" (*H.N.* 25.37).

"In fact, it is well known that even the leaves [of hyoscyamus] affect the brain if more than four are taken in drink; yet the ancients used to take them in wine under the impression that fever was relieved. Oil is made from the seed, as I have said,[134] which by itself if poured into the ears deranges the brain. It is a wonderful thing that they have prescribed remedies for those who have taken the drink, which implies that it is a counteraction to a poison, and yet have included it among remedies; so unwearied have been researches in making every possible experiment, even to compelling poisons to be helpful remedies" [trans. Jones, Vol. 7 p. 162; slightly modified].

---

[134] See Plin. *H.N.* 15.30 and also Plin. *H.N.* 23.94

Pliny emphasises the hallucinogenic effects of hyoscyamus.

"*Natura vini ideoque mentem caputque infestans*" (*H.N.* 25.36).

"It has the character of wine, and therefore injures the head and brain".

As a narcotic and sleep inducer, Celsus regarded hyoscyamus as an alternative to poppy.

"Si nihili minus vigilant, quidam somnum moliuntur potui dando aquam, in qua papaver aut hyoscyamos decocta sint" (3.18.12).

"If in spite of this patients are wakeful, some endeavour to induce sleep by draughts of decoction of poppy or hyoscyamus".

Dioscorides records several medical uses of hyoscyamus. According to him the plant had soporific and analgesic properties and was also used to alleviate local specific pain and inflammations. He considers hyoscyamus juice to be more effective than poppy juice and according to him it was a more potent analgesic. The juice (both fresh and from the dry seed) was primarily suitable for analgesic eye salves (4.68.3).

4.4.2 GENERAL PAIN RELIEF

4.4.2.1 Local anodyne

Celsus describes the following fomentation which was used as a local Anaesthesia:

"*Utile est etiam sebum miscere cum hyoscyami et urticae contritis seminibus, sic ut omnium par modus sit, idque imponere; fovere aqua, in qua sulpur decoctum sit*" (3.27.2C).

"It is also of service to mix fat with pounded hyoscyamus and nettle seeds, equal parts of each, and put this on, also to foment with a decoction of sulphur".

It was applied to the skin were it had been injured. The fat in this mixture acted as emollient, making the application easier, while the stickiness it provided kept the ointment in place.

Dioscorides similarly refers to pain-allaying plasters which contained hyoscyamus. The moulded leaves provided an effective anodyne plaster when mixed with barley

groats or when plastered on by themselves; however, when fresh leaves were used to make a plaster, they created an even more effective analgesic (4.68.4).

4.4.2.2 Pain of the Nervous System

In the following mixture described by Pliny, the barley meal was included to relieve the swelling and inflammation, while the hyoscyamus would have made the patient indifferent to pain.

"*Nervis cum hyoscyami suco inlinitur*" (*H.N.* 22.124).

"To sinews it [barley meal] is applied with juice of henbane".

4.4.2.3 Pain in the joints, arthritis and gout

Both Pliny and Celsus prescribe emollients, made up of hyoscyamus juice and mixed with grease to relieve rheumatic pains caused by inflammation of the joints. Pliny provides the following recipe for an ointment which would act as a local anodyne, to relieve arthritic pains. Again the wax acts as an emollient.

"*Articulis sucus hyoscyami cum axungia...*" (Plin. *H.N.* 26.105).

"For [pain of] the joints juice of henbane with axle-grease..."

The emollient that Celsus provides also includes the wax, which indicates that this remedy was also used as a topical emollient. It reads as follows:

"*Ad dolores articulorum Sosagorae: plumbi combusti, papaveris lacrimae, cortices hyoscyami, styracis, peucedani, sebi, resinae, cerae, pares portiones*" (5.18.29).

"The emollient of Sosagoras for pain in the joints contains calcined[135] lead, poppy tears, hyoscyamus bark, storax, sulphurwort, suet[136], resin and wax, in equal parts".

Dioscorides confirms that the juice of hyoscyamus was useful for the treatment of severe and fevered rheums, (4.68.3), while Pliny also recommended the juice or seeds of hyoscyamus for patients who suffered from gout.

---

[135] *combusti* = "roasted".
[136] Any form of fat derived from an animal, i.e. sebum (fat from a follicle), wool grease or even pig lard.

"*Medentur radices panacis cum uva passa, sucus hyoscyami cum farina vel semen*" (*H.N.* 26.100).

"Useful remedies [for gout] are roots of panaces with raisins, juice of henbane with meal [flour] or the seed of henbane".

4.4.2.4 Inflammation

Pliny mentions that the anti-inflammatory properties of hyoscyamus were employed to reduce swelling in the testicles.

"*Testium tumor sedat hyoscyamus*" (*H.N.* 26.89).

"Hyoscyamus reduces swollen testicles".

Dioscorides writes: "Mixed with flour or with barley groats it was administered to alleviate inflammation in general and of any body part e.g. the eyes or the feet" (4.68.3).

4.4.2.5 Eye medication

Hyoscyamus was also used in the treatment of sore and infected eyes. According to Celsus it was applied locally and acted as an anodyne. The leaves were probably moulded before being mixed with the yolk of an egg for easier application, since fresh leaves would have been difficult to apply.[137]

Pliny also describes a decoction containing hyoscyamus for the treatment of eye flux.

"*Hyoscyami semen et bibunt obolo, tantumdem meconii adicientes vinumque ad epiphoras inhibendas*" (*H.N.* 25.142).

"For checking such tears the seed of henbane is taken in wine in doses of an *obolus*[138] with the same amount of poppy juice".

---

137 "...*aut hyoscyami folia cum ovi vitello cocti*" (Cels. 6.6.9).
"...or hyoscyamus leaves with the yolk of a boiled egg".

138 0.568g

4.4.2.6 Ear ache

According to Celsus the undiluted juice of hyoscyamus or a decoction containing the juice was applied directly to relieve extreme pain in the ears. The decoction, mixed with poppy, was rather potent.

"*Aut aluminis scissilis, papaveris lacrimae, acacia suci par pondus miscetur, hisque adicitur hyoscyami suci dimidio minor quam unius ex superioribus portio, eaque trita ex vino diluuntur. Per se quoque hyoscyami sucus satis proficit* " (6.7.2D).

"Or equal weights of shredded[139] alum, poppy-tears and acacia juice are mixed together, and to these is added of hyoscyamus juice less than half the quantity of each one of the above; and these are pounded together and diluted with wine. Also hyoscyamus juice is sufficiently beneficial by itself."

Both Dioscorides and Pliny confirm that the local anaesthetic effect of hyoscyamas was employed to alleviate pain in the ears (Diosc. 4.68.3).[140]

4.4.2.7 Other medicinal effects of hyoscyamus

According to Dioscorides the seed also offers the same cures, and is prescribed for coughs, catarrh, running eyes, and for severe pain; for excessive menstruation and for bleeding of any kind. To stop bleeding an amount of one *obol*[141] is drunk with poppy seed and hydromel. It is also suitable for gout, for swollen testicles, and for swollen breasts during pregnancy. For this purpose it should be applied as a plaster after being ground and mixed with wine (4.68.4). Three or four leaves, taken in a drink with wine, will treat shivering fits of fevers, but if a bowlful of them is eaten boiled like vegetables, it will cause delirium. Used in a suppository it was employed to treat a colon ulcer (4.68.5).

---

139 It is not possible to shred aluminum salts since it is too hard. According to Scarborough a better translation would therefore be "scissile alum" since in mineralogy 'scissile' occurs in miniature (or larger) plates, which are "split" from each other.

140 "*Medentur et aurium dolori, item sucus inunctus hyoscyami modicus*" (Plin. *H.N.* 25.164).
"They [Andrachle or in Italian Inlecebra] also cure ear-ache, as does the application of a moderate amount of juice of henbane".

141 0,568 gram

From Pliny we learn that the ancients employed hyoscyamus in the treatment of orthopnoea.[142]

"*Et orthopnoicis quod ternis digitis prenderit seminis, tantumdum hyoscyami cum lacte asinine*" (*H.N.* 20.193).

"And for orthopnoea a three-finger pinch of the seed [of coriander], the same quantity of henbane, and asses' milk added."

Hyoscyamus was added to the decoction prescribed for this ailment, because of its narcotic properties. It would have helped the patient to relax and sleep, albeit in an uncomfortable position.

Pliny also mentions the use of hyoscyamus as an air freshener! According to him hyoscyamus removes unpleasant odours, especially the smell of sweat in the armpits after a long day's work.[143] He also claims that it was used as an emollient, to soften the skin where callouses have formed.[144]

It seems that the juice of hyoscyamus was commonly used in the case of ailments associated with the uterus (Diosc. 4.68.3). Pliny confirms this and mentions its use to alleviate excessive menstruation and to clean the womb.[145] He describes the different forms of application as follows:

"*Mammis inponitur hyoscyami semen ex vino – locis radix in cataplasmate*" (*H.N.* 26.152).

"To the breasts is applied henbane seed in wine – but to the uterus henbane root in a plaster".

---

142 Orthopnoea is diagnosed when the patient experiences breathlessness which prevents the patient from lying down. He has to sleep propped up in bed or sitting in a chair (Martin *et al.* 2002:492).

143 "*Item sicca cum hyoscyamo et pice liquida, alarum quoque et feminum vitia*" (Plin. *H.N.* 22.72).
"Further that dried and mixed [asphodel] with henbane and melted pitch it does the same for unpleasant odour from armpits and thighs".

144 Plin. *H.N.* 23.94

145 "*Haedorum pilis suffiri vulvas utile putant et in profluvio sanguinis coagulum bibi aut cum hyoscyami semine inponi*" (Plin. *H.N.* 28.256).
"To fumigate the uterus with the hairs of kids is thought to be beneficial, and it is so for a flux of blood of kid's rennet is taken in drink, or applied locally with seed of hyoscyamus".
Scarborough suggests the following explanation for this passage: " *putant* (they believe [that]) fumigation with burning/smoking hairs from young goats is beneficial for external sexual parts, and also [*putant*] that a drink fashioned form a young goat's rennet is useful for an excess of bleeding, or a haemorrhage [can be stopped] with a plaster of henbane seeds".

4.5 TOXICITY

Pliny warns against the adverse effects of hyoscyamus:

"*Hyoscyaminum emolliendo utile est, nervis inutile. Potum quidem cerebri motus facit*" (*H.N.* 23.94).

"Oil of henbane is useful as an emollient but injurious to the sinews [or nerves]; indeed if drunk it causes derangement of the brain".

4.5.1 ANCIENT ANTIDOTE

Several antidotes were known to relieve the toxicity caused by overdosing with hyoscyamus. The following antidotes are mentioned by the ancient sources: asses' milk,[146] (or a draught of woman's milk[147] or any kind of milk[148]), radishes,[149] garlic,[150] nettle and the broth of boiled tortoise[151] as well as hydromel.[152]

---

146 "*Asinio lacte poto venena restinguntur, peculiariter si hyoscyamum potum sit aut viscum aut cicuta*" (Plin. *H.N.* 28.158).
"By drinking ass's milk poisons are neutralized, especially if henbane has been swallowed, or mistletoe or hemlock".

147 "*...matris lacte...Ut Aristoteles tradit, dorycnio, et contra insaniam quae facta sit hyoscyami potu*" (Plin. *H.N.* 28.74).
"As Aristotle tells us (mothersmilk relieve the poison), of *dorycnium*, and for the madness caused by drinking henbane".

148 "*Si hyoscyamum, fervens mulsum bibendum est, aut quodlibet lac, maxime tamen asininum*" (Cels. 5.27.12B).
"If it be hyoscyamus, honey wine should be drunk hot, or milk of any kind, especially asses' milk".

149 "*Salutares et contra fungorum aut hyoscyami venena*" (Plin. *H.N.* 20.25).
"Radishes too counteract the poisons of mushrooms and of henbane" [trans. Jones, Vol. 6 p. 17; slightly modified].

150 Ac, *ne contra araneorum murium venenatum morsum valere miremur, aconitum, quod alio nomine pardalianches vocatur, debellat, item hyoscyamum* (Plin *H.N.* 20.50).
"Lest we be surprised that it [garlic] is an antidote against the poisonous bite of the shrewmouse, it neutralizes aconite, which is also known by the name of *pardalianches* [leopard strangler], as well as henbane".

151 "*Semen eius cicutae contratium esse Nicander adfirmat, item fungis et argento vivo, Apollodorus et salamandris cum iure coctae testudinis, item adversi hyoscyamo et serpentibus et scorpionibus*" (Plin. *H.N.* 22.31).
"Nicander assures us that its seed [of the nettle] counteracts hemlock, and also the poison of mushrooms and of mercury. Apollodorus says that with the broth of boiled tortoise it is good for salamander bites, and as an antidote for henbane, snake bites and scorpion stings".

152 "*Item contra hyoscyami cum lacte maxime asinine*" (Plin. *H.N.* 22.112).
"[Hydromel] also with milk, especially asses' milk, for henbane [poisoning]".

MODERN HYOSCYAMUS

4.6 MORPHOLOGY

Van Wyk and Wink (2004:174) describe hyoscyamus as an annual (var. *β-annua*) or biennial (var. *α-annua*) herb with slightly sticky, soft hairy erect stems bearing pale green, lobed and hairy leaves.

The calyx is bell-like and toothed, and the petals are greyish yellow with dark purple veins towards their bases (Lewis 1977:54).

The flowers are found in the leaf axils (Lewis 1977:54) and the fruit is a small, two-celled pyxis, which contains numerous seeds (Evans 2002:344).

The seeds are dark grey in colour, somewhat reniform in shape and about 1.5 mm long. The seeds have an internal structure which closely resembles that of D. stramonium. The seeds contain about 0.06 - 0.1% of alkaloids (hyoscyamine with a little scopolamine and atropine (Evans 2002:344).

The annual plant usually flowers in July or August and the biennial one in May or June (Evans 2002:344).

The taste and odour are unpleasant and characteristic (Williamson 2003:216).

4.6.1 ONTOGENIC VARIATION

According to Duke (1985:241), young plants contain more hyoscine and less hyoscyamine: in mature plants hyoscyamine constitutes the main active alkaloid. Evans says (2002:345) that the petiole appears to contain more alkaloid than the lamina or stem.

4.7 DISTRIBUTION

Hyoscyamus niger is native to Eurasia and northern Africa although it is also widely cultivated in parts of North America (Lewis 1977:54). Budevari (2001:870) adds Asia as well as Russia and Germany to the list of places where hyoscyamus is found (Uphof 1968:276). It also grows in waste areas in Britain and Europe (Williamson 2003:216).

4.8 PROCESSING OF THE PLANT

A tea is also brewed from the fresh leaves (Duke 1985:240). The dried leaves are rapidly dried by artificial heat at a temperature of 40 - 50°C (Evans 2002:344) and used as a cataplasm for tumors (Duke 1985:240, 241). The juice is prepared in various ways and the leaves are applied locally. The juice is used in any form to treat cancer and cancerous wounds. The leaves are considered anodyne, antidiabetic, antispasmodic, carminative, hypnotic, mildly laxative, mydriatic, narcotic and sedative. The herb is used for asthma, bronchitis, cough, hydrophobia, neuralgia and rheumatism (Duke 1985:240).

4.9 ADMINISTRATION

Hyoscyamus is taken in the form of a brewed tea while the dried leaves are smoked to relieve asthma (Duke 1985:240). In India the powdered seeds are used to relieve toothache or the seeds are burnt so that the patient can inhale the smoke. The powdered seed mixed with wine is applied to gout swellings (Duke 1985:240). The seed pessary is used to relieve pain in the uterus and homeopaths prescribe the tincture for any pain or psychological problem (Duke 1985:240).

4.10 PHYTOCHEMISTRY

Hyoscyamine is the major compound and scopolamine is also found in high yield (Van Wyk *et al.* 2004:174). Other tropane alkaloids have been found in the foliage and seeds of the plant (Roberts *et al.* 1998:31). Alkaloids occur in concentrations of 0.04 – 0.15% of dry weight in the leaves (Budevari 2001:870), 0.16% in the roots (Duke 1985:241) and up to 0.3% is found in the seeds (Van Wyk *et al.* 2004:174).

4.10.1 SCOPOLAMINE

Scopolamine is also known as (αS)-α-(Hydroxymethyl)-benzeneacetic acid (1α,2β,4β,5α,7β)-9-methyl-3-oxa-9-azatricyclo[3.3.1.$0^{2,4}$]non-7-yl ester. $C_{17}H_{21}NO_4$ has a molecular weight of 303.35. C = 67.31%, H = 6.98%, N = 4.62% and O = 21.10%. It is a viscous liquid which is soluble in 9.5 parts of water at 15°C. It is freely soluble in hot water, alcohol, ether, chloroform, acetone and ether. It forms a crystalline monohydrate structure with a melting point of 59°C. (Budevari 2001:1507).

4.10.2 BIOGENESIS OF HYOSCINE

Ancients knew all the effects eventually through empirical observation. Phyto-chemistry uses biogenic routes to explain and confirm the ancients' observations in specific terms. Hyoscine appears to be formed in the leaves of D. stramonium from hyoscyamine via 6-hydroxyhyoscyamine and 6,7-dehydrohyoscyamine (Evans 2002:340).

4.11 DOSAGE

The dry extract dosage of Hyoscyamus which homeopaths use varies between 15 - 60 mg (Williamson 2003:216).

4.12 PHARMACOKINETICS

Hyoscyamine ($C_{17}H_{23}NO_3$) is the main active alkaloid (also the laevo-isomer) of atropine into which it can be converted by heating or by the action of alkali (Sweetman 2002:469). This is an alkaloid found in hyoscyamus but it is also possible to prepare it by synthesis (Sweetman 2002:460). Especially *H. muticus* is used because it has a high content of alkaloids (up to 1%); therefore it is a commercial source of tropane alkaloids (Van Wyk *et al.* 2004:174).

Atropine is readily absorbed from the gastrointestinal tract and also from mucous membranes, but, since it is water-soluble, it does not penetrate the blood-brain barrier very much. It has rather limited effects on the central nervous system. (Brown *et al.* 1996:150).

4.13 PHARMACOLOGY

The seeds are used as analgesic and astringent (Evans 2002:479). Tropane alkaloids are parasympatholytics and have a spasmolytic and sedative effect on the central nervous system (Van Wyk *et al.* 2004:174). It first stimulates and then depresses the central nervous system and has an antispasmodic effect on the smooth muscles in the body; it thus reduces secretions, especially saliva in the mouth and respiratory system, as well as sweat. Atropine depresses the vagus nerve and thereby increases the heart rate.

In anaesthesia it is used as premedication in combination with opioids to counteract the muscarinic effects of anticholinesterases (especially neostigmine). It also diminishes the risk of vagal inhibition of the heart and reduces salivary secretions (Sweetman 2002:462).

The dried leaves are used in the treatment of alcohol and morphine addiction as a mydriatic, sedative, pain-killer and in motion sickness (Duke 1985:240, 241).

4.14 TOXICITY

Modern pharmacological descriptions of these plants suggest hallucinations, toxicity and death in cases of overdosing (Hoffmann 2003:122).

Diagnosis of *Hyoscyamus niger* intoxication is based on clinical symptomatology and history. Therapy includes stomach lavage, supportive therapy, and physostigmine as a specific antidote (Doneray *et al.* 2007:350) for antimuscarinic poisoning (Sweetman 2002:461). Duke adds caffeine or morphine as an antidote (Duke 1985:241) but according to Lewis (1977:54), poisoning is not very common, due to its unpleasant taste.

4.15 CONCLUSION

The texts of Celsus, Pliny and Dioscorides all suggest positive use of hyoscyamus in a number of therapies, especially if a practitioner desired to alleviate or control pain. Given the species' rich constituents of tropane alkaloids, modern pharmacognosy has confirmed the basic outlines of Graeco-Roman empirical observation in the effects and use of hyoscyamus (§4.12).

The modern **physical** (§4.6) and **phytochemichal** description (§4.10) of hyoscyamus confirms the observations made by the ancients. This facilitates the identification of the plant and its properties. When the ancient and modern morphology are compared (see table under 4.1), the various modern species correlate with those described in the ancient texts. Both modern (§4.6) and ancient descriptions (§4.1) mention the purple flowers and toothed calyx.

The ancients **used** the juice of the stems, leaves and seeds (§4.3). The juice was extracted and brayed to form lozenges. The ancients drank decoctions of the leaves, applied it locally and used it as a suppository. Hyoscyamus oil was used to relieve

earache and a specific decoction gargled to relieve pain in the throat. They inhaled the fumes of burnt leaves to relieve coughing and chewed the root as a remedy for toothache (§4.5). In traditional modern folk medicine, cataplasms of leaves are used, the leaves are smoked or infused into a tea (§4.110.2). As in ancient times users still powder the seeds, burn it, inhale the smoke, and use the seeds to form a suppository for the relief of pain (§4.4).

Hyoscyamus was prescribed in ancient times as **anodyne** and perhaps also as **anaesthetic** (§4.4.1). Phytochemistry confirms that atropine is not rapidly cleared from the blood and does not penetrate the blood-brain-barrier to induce sedation (§4.12), but scopolamine does. Atropine is not generally used for the treatment of pain, but it is a competitive antagonists of the actions of acetylcholine and other muscarinic agonists. Thus, at the autonomic ganglia, atropine produces a partial block, which prevents the passing of pain-impulses (Brown *et al.* 1996:148).

Hyoscyamus juice was prescribed as a **cough remedy** (§4.4.2.7) while inhalation of the fumes from the burnt leaves relieved coughing and orthopnoea. This effect is to be expected since the active ingredient hyoscyamine has bronchodilatory effects (Van Wyk *et al.* 2004:174).

For the **pain and infection of the eye** (§4.4.2.5), a mixture of the leaves was made. It would be pharmacologically possible, since atropine is a vasodilator (§4.13) and it would lessen the intense pressure in the eye in the case of inflammation. The muscarinic receptor antagonists block the responses of the sphincter muscle of the iris.

Pliny's (§4.4.2.4) claims that hyoscyamus had **anti-inflammatory properties** and was employed to reduce swelling and pain of the testicles and breasts might very well have some merit. Hyoscyamus would dilate the smooth-muscle in the arteries and veins and with better blood flow, the fluid would be absorbed in the body, since it has vasodilatory as well as spasmolytic effects (§4.13). This anti-inflammatory effect would also have an effect on shivering fits of fevers. The vasodilating effect would dilate the arteries, which would increase the bloodflow and would lower the body temperature. Since atropine is a vasodilator, it would not stop any bleeding but even worsen it (§4.13). This indication of the ancients is not valid.

The natural alkaloids in hyoscyamus are naturally occuring muscarinic antagonists and will have the required effects on the body if used according to the correct **dosages** and for the right indications. An administration range of 10 mg can prove to be fatal and as little as 0.5 mg can have a marked effect on the human body (§4.11).

The pharmacological description of hyoscyamus (4.12) proves that in most cases the ancients used it for the correct indications and that it would indeed induce sleep, relieve pain and inflammation and reduce coughing.

CHAPTER 5
CONIUM MACULATUM L.

English - Hemlock, Poison parsley, Musquash root, Herb Bennet, Beaver poison, Spotted hemlock

Afrikaans - Dollekerwel

Hemlock was known in Rome as *Cicuta* and Linnaeus changed the name in 1753 in the great *Species plantarum*, giving it the Greek name *Konas* ("to whirl about" because ingestion of the plant causes vertigo and death). The English word "hemlock" is derived from the specific name in Latin which refers to the spotted stem-markings: *Conium maculatum* (*maculatus, -a, -um* = spotted) (Evans 2002:8).

Hemlock is also poisonous, and the plant has a bad reputation since the Athenians made it their instrument of capital punishment (Plin. *H.N.* 25.151). The most famous victim of hemlock poisoning is the philosopher Socrates. After being condemned to death for impiety in 399 BC., Socrates was given a potent solution of the hemlock plant. Plato describes Socrates' death in the *Phaedo.* The English translation (Church 1906:210) reads as follows: "The man ... laid his hands on him and after a while examined his feet and legs, then pinched his foot hard and asked if he felt it. He said 'No'; then after that, his thighs; and passing upwards in this way he showed us that he was growing cold and rigid. And then again he touched him and said that when it reached his heart, he would be gone. The chill had now reached the region about the groin, and uncovering his face,[153] which had been covered, he said — and these were his last words — 'Crito, we owe a cock to Asclepius. Pay it and do not neglect it.' 'That,' said Crito, 'shall be done; but see if you have anything else to say.' To this question he made no reply, but after a little while he moved; the attendant uncovered him; his eyes were fixed. And Crito when he saw it, closed his mouth and eyes" (Plato, *Phaedo* 117e–118a).

---

[153] Plato, *Phaedo*. 118a. Plutarch also refers to two immediate predecessors of Augustus, Pompey and Julius Caesar, who also covered their faces with their togas as they met their sudden, unforeseen deaths Plut. *Pomp.* 79).

Although many have questioned whether this is a factual account, Bloch shows that careful attention to Plato's words, comparison with modern and ancient medicine and other ancient Greek sources go a long way to prove that the above account is consistent with *Conium* poisoning (Bloch 2001:1). Dioscorides also classifies this plant amongst the poisonous ones, and adds that it kills by thoroughly chilling the body (4.78.1).

We read in Pliny that Androcydes[154] wrote a letter to Alexander the Great in an attempt to restrain his intemperance. "When you are about to drink wine, O King, remember that you are drinking the earth's blood. Hemlock is poison to a human being, and wine is poison to hemlock" (*H.N.* 14.7). If Alexander had heeded this advice, he might not have killed his friends Clitus and Callisthenes in a drunken fit (Plin. *H.N.* 24.58). Pliny thinks that poisonous mixtures are invented to promote drinking, since some men take a dose of hemlock before they start drinking, and then fear of death compels them to drink too much wine (*H.N.* 24.138)!

5.1 MORPHOLOGY

Dioscorides gives the following description of the hemlock-stem: "...it sends up a large stem, knotty like fennel" (4.78.1). The stem was eaten by many both as a salad and when cooked in a saucepan. Pliny says that the stem is smooth, and jointed like a reed, of a dark colour, often more than two cubits[155] high and branchy at the top (*H.N.* 25.151). Theophrastus (*H.P.* 6.11.9), Pliny (*H.N.* 25.151) and Dioscorides (4.78.1) all agree that the stem is hollow.

According to Dioscorides (4.78.1),"...the leaves resemble those of giant fennel,[156] but narrower and oppressive in scent and at the top it has side-shoots and umbels of whitish flowers". Regarding its leaves Theophrastus thinks that they resemble those of parsley (*H.P.* 7.6.4), while Pliny considers the leaves to be more similar to coriander, although more tender. He confirms Dioscorides' remark about the strong smell of hemlock (*H.N.* 25.151).

---

154 Androcydes, a Greek physician, who lived in the reign of Alexander the Great, 336—323 BC. It is mentioned by Pliny (*H.N.* 17.37), that he ordered his patients to eat a radish as a preservative against intoxication, from having observed (it is said) that the vine always turned away from a radish which grew near it. It is very possible that this Androcydes may be the same person who is mentioned by Theophrastus (*H.P.* 4.16.20), and also by Athenaeus 6. p.258, b (Greenhill 1870:172).

155 Approximately 60 cm.

156 According to Beck (2005:432) there are possibly three species: *Ferula persica* Willd, *Ferula communis* L. and *Ferula galbaniflua* L. (See also Diosc. 3.77; 3.81; 3.87).

Pliny says that the seed is poisonous and coarser than anise (*H.N.* 25.151) and Dioscorides describes the colour as whiter than that of anise (4.78.1).

Theophrastus remarks that while the juice extracted from the roots of other plants is less powerful than that of the fruit, it is stronger in the case of hemlock and it causes an easier and speedier death even when administered in quite small doses (*H.P.* 9.8.3). Pliny and his sources add that juice is also extracted from the leaves and blossoms, and that the best time to do so is when the hemlock is in flower. A better juice is extracted from the crushed seed which has thickened in the sun for the purpose of making lozenges. The juice is also used as a solvent for drugs instead of water (*H.N.* 25.153).

5.2 DISTRIBUTION

Theophrastus writes that Thrasyas of Mantinea gathered his hemlock, not just anywhere, but at Susa[157] or in some other cold and shady spot; (*H.P.* 9.15.8). Although Susa has the best hemlock, many of these plants also grow in Laconia, for this too is a land rich in medicinal herbs (Theop. *H.P.* 9.15.8).

Dioscorides says that the most potent varieties of hemlock are found in Crete, Megara, Attica and also in Chios and Cilicia (4.78.2). Pliny agrees with Theophrastus that the most powerful hemlock grows at Susa in Parthia, and also mentions the hemlocks of Laconia, Crete and "Asia".[158] In Greece Megara is first on his list of places where the plant is found, after which comes Attica (*H.N.* 25.154).

5.3 PROCESSING OF THE PLANT

Theophrastus describes several ways of obtaining the hemlock juices. He observes an improvement in the processing of the drug which has a marked influence on its quality. The people of Ceos formerly just shredded hemlock up for use and cut it into pieces. Then they bruised the plants, poured water over, strained the fluid off, keeping the sediment; this method produced juice that was dry and less copious (*H.P.* 9.8.3).

---

157 Hort (1916:255) remarks that the mention of Mantinea makes it likely that a place in Arcadia is intended. According to Hammond *et al.* (1970:1026), Susa was also known as the "City of Lilies" and it was the capital of Elam.

158 The name was probably derived from '*Assiuva*', the Hittite designation of north-west Asia Minor (Hammond *et al.* 1970:130).

"Now they first strip off the outside and take off the husk, as it is not easily assimilated; then they bruise the peeled, dehusked part in the mortar, and, after putting it through a fine sieve, they sprinkle it on water before drinking it; if the hemlock is prepared in this way, death comes swiftly and easily" (*H.P.* 9.14.9).

Pliny relates a different tradition regarding which plant parts contained the best juice. A juice[159] is extracted from the leaves and blossoms and the best time to do so is when the hemlock is in flower (*H.N.* 25.152). Dioscorides confirms that the top foliage was cut and pressed to obtain the juice (4.78.1). According to both these authors an even better juice is extracted from the crushed seed which is then thickened in the sun for making into lozenges (Plin. *H.N.* 25.152; Diosc. 4.78.1). This juice was used instead of water as a medium for drugs. Pliny reports that the juice was also used to make a poultice which cooled the stomach (*H.N.* 25.153).[160]

Pliny also describes how to process hemlock when used to cure erysipelas: the leaves are hung over smoky must, and finally pounded. It is mixed with wine or vinegar and it is used as a liniment (*H.N.* 26.121).

5.4 ADMINISTRATION OF THE DRUG

Pliny gives the most information regarding the administration of hemlock. He writes that it was used as a local application (*H.N.* 25.153) and that the seeds were inserted into the nostrils to stop bleeding (*H.N.* 26.131). The juice, drunk in undiluted form was believed to be fatal (*H.N.* 25.152), but it was also thickened to make lozenges or a poultice (*H.N.* 25.153).

5.5 EFFECTS

5.5.1 SLEEP

Celsus records two recipes that incorporate hemlock as an ingredient, along with other narcotics (mandragora and poppy). Such a combination of soporifics is pharmaceutically predictive of profound effects in humans.

---

159 χύλος means juice, moisture or a decoction. It also means the flavour or taste of something, or juice drawn out by digestion (Liddell *et al.* 1966:792).

160 The similarity of information given by Pliny and Dioscorides indicates a common source, probably Sextius Niger (Wellman 1906-1914:239).

5.5.1.1 Some recipes containing hemlock

Recipe 1

The ancients believed that it was important to sleep well. If pain prevented them from sleeping, a mixture was prescribed in order to induce sleep. Celsus provides us with such a recipe:

"Item si vulva dolens somnum prohibet, croci P.==; anesi, murrae, singulorum P.*I; papaveris lacrimae P.*III; cicutae seminis P.*VIII miscentur excipiunturque vino vetere, et quod lupini magnitudinem habet in tribus cyathis aquae diluitur. Id tamen in febre periculose datur* "(5.25.5).

"Again, if inflammation[161] of the womb prevents sleep, take saffron 1,33 grams, anise and myrrh, 4 grams each, poppy-latex 12 grams, hemlock seed 32 grams. These are mixed together, and taken up in old wine, and a pill size of a lupine[162] is dissolved in 125 c.cm of water. It is dangerous, however, to give it when there is fever".

ANALYSIS:

INGREDIENT	AMOUNT
Saffron	1.33g
Anise	4g
Myrrh	4g
Poppy	12g
Hemlock	32g
Water	125mL

The total amount of ingredients is 53.3g of which hemlock constitutes 32g. This means that 125mL of fluid contains 60% hemlock and 22.5% opium. Although the

---

161 *Vulva dolens* is translated by Jones as "inflammation of the womb". A more accurate and literal translation of the phrase would be "pain of the vulva".

162 Spencer's translation is ambiguous. What is meant is that the amount of the dosage is equal to the size of a lupine seed. According to Pulse (2008:01) the lupine, *L. angustifolius* L. is the annual plant that was used in ancient medicine. The size of the seed is not fixed, but can range between 30 and 240 mg, which does not give a precise measurement.

analgesic or soporific properties of saffron, anise and myrrh are uncertain, the compounding of opium and hemlock assures a powerful somniferant.

Recipe 2

Celsus provides the following recipe for the preparation of an eye-ointment. It is preferably applied at night, in order to assure better sleep.

"Aliud ad idem: murrae P.-; mandragorae suci P.*I; papaveris lacrimae P.*II; foliorum rosae, cicutae seminis, singulorum P.*III; acaciae P.*IIII; cummis P.*VIII"* (Cels. 6.6.1.I).

"Another composition having the same efficacy is made up of: myrrh 0.33 grams, mandragora juice 4 grams; poppy tears 8 grams; rose leaves and hemlock seeds 12 grams each; acacia 16 grams; gum 32 grams".

ANALYSIS:

INGREDIENT	AMOUNT
Myrrh	0.33g
Mandrake juice	4g
Poppy tears	8g
Rose leaves	12g
Hemlock seed	12g
Acacia	16g
Gum	32g

What Celsus does not reveal are the detailed pharmacological technologies behind his listing of simples. In this recipe, the total quantity of ingredients is 84.33g. 12g hemlock gives a proportion of 14%, as compared to 4.7% mandrake and 9.4% opium. The two gums (Acacia and tree gum), are added to thicken the mixture, while the acacia gum also improved the smell and taste of the medicine. Rose leaves make effective soothing oil; mandrake "juice" can come from either the "apples" or the peeled root, or the peelings themselves; myrrh is melted before adding to any compound; opium latex likewise (it comes in little, sun-dried pellets). According to

Theophrastus the hemlock was prepared as small pills or pastilles, and then added to the compound (*H.P.* 9.14.9).

5.5.2 PAIN AND INFLAMMATION

Celsus writes that hemlock acts as anodyne (5.25.5) and Pliny adds that the leaves also relieve every kind of swelling, pain or flux[163], even the swelling caused by dislocations[164]. Abscesses and foul ulcers are also healed.[165]

The following recipe is a painrelieving mixture supplied by Pliny. The axle-grease in the mixture would again act as emollient to facilitate the application.

"doloremque et tumores tollunt semen psyllii, folia plantaginis trita, sale modice addito, verbasci semen ex vino decoctum tritum, cicuta cum axungia" (*H.N.* 26.122).

"Pain and swelling are taken away by seed of psyllion, plantain leaves beaten up with a little salt, ground seed of verbascum[166] boiled in wine, and hemlock with axle-grease".[167]

5.5.3 ERYSIPELAS

Both Dioscorides and Pliny attest to the effectiveness of hemlock leaves as a cure for erysipelas (Diosc. 4.78.2; Plin. *H.N.* 26.121).[168] In its dried form Dioscorides prescribes it for restoring general health and he believes that, when plastered on [as a poultice], it quells shingles (4.78.2).

---

163 "*folia quoque tumorem omnem doloremque et epiphoras sedant*" (Plin. *H.N.* 25.153).
A flux refers to abnormally copious flow from an organ or cavity (Martin 2002:265)

164 "*...inlita luxatis medetur doloremque et tumores tollunt...cicuta cum axungia*" (Plin. *H.N.* 26.122).
"...liniment is a remedy for dislocations, and the pain and swelling are taken away by...hemlock with axle-grease".

165 "*cum cerato apostemata et ulcera taetra folia mandragorae recentia, radix volnera cum melle aut olea, cicuta cum siligine mixta mero*" (Plin. *H.N.* 26.144).
"Abscesses and foul ulcers <may be treated with> fresh leaves of mandrake and wax-salve, wounds with its root and honey or oil, or with hemlock added to wheat and neat wine".

166 *Verbascum thapsus* L. The mulleius are a genus in the figwort family (*Scrophulariaceae*). They are native to Europe and Asia with the highest species diversity in the Mediterranean region (Davis 1978:428).

167 Probably either olive oil or pig lard since it needed to be a thick oil base.

168 "*Igni sacro medentur...folia trita cicutae*" (Plin. *H.N.* 26.121).
"Erysipelas is treated with... pounded leaves of hemlock".

5.5.4 GOUT OR "GOUTY CONDITIONS"

Hemlock was used as an emollient (Cels. 5.9.15), and as such it was regarded as useful for the treatment of gout, because of its cooling effect (Cels. 5.18.1). Dioscorides also writes that hemlock was used as a liniment to relieve the pain (4.78.2).

Recipe

The ancients probably did not know about lifestyle changes to prevent the severe inflammation caused by gout. There are several recipes available, which means that gout was a common complaint. The following cure is prescribed in Pliny's *Historiae Naturalis*:

"Podagras refrigerat cicuta cum lithargyro aut axungia" (*H.N.* 26.101).

"Cooling applications for gouty pains are made from hemlock with litharge[169] or axle-grease".

Celsus supplies us with another cooling recipe for gout:

"Est tamen, quod refrigerare possit, ad calidas podagras aptum. Habet gallae et immaturae et alterius, coriandri seminis, cicutae, lacrimae aridae, cummis, singulorum plenum acetabulum; cerati eloti, quod πεπλυμένον Graeci vocant, selibram" (5.18.1).

"There is, however, one kind which can cool, being suitable for hot "gouty feet". It is a cupful of oak-galls,[170] unripe or otherwise, coriander seed, hemlock, dried poppy-tears, and gum, of each 63.3 c.cm; of washed cerate called πεπλυμένον by the Greeks, 168 grams".

5.5.5 EYE DISEASES AND CATARRHS

Hemlock's chief use however was to check summer fluxes, to relieve soreness of the eyes and to check all catarrhs [171] generally. It was applied locally around the eyes and was a common ingredient of eye salves (Plin. *H.N.* 25.153). Celsus says that the hemlock in eye-ointments was mixed with mandrake juice and poppy tears (6.6.I).

---

169 It is a mineral which some make into a silver nitrate. PbO (Diosc. 5.87). For a modern description of litharge, see Smyth *et al.* (2000:01).

170 The fruit of the oak tree (Diosc. 1.107).

171 Excessive mucus in the nose and throat, often experienced during or following a cold [Greek *katarrhein* to flow down].

5.5.6 EPISTAXIS (NOSE BLEEDS)

Pliny states that hemlock stopped haemorrhage, especially epistaxis by either the insertion of the seeds (*H.N.* 26.131) or pounded seeds in water into the nostrils.

"*Per nares autem fluenti et cicutae semen tritum ex aqua additumque efficax habetur*" (*H.N.* 26.136).

"For epstaxis however hemlock seed also beaten up in water and inserted into the nostrils is held to be efficacious".

5.5.7 OTHER USES

Dioscorides enumerates a few other uses of hemlock: "The herb and the foliage, ground up and applied to the testicles, come to the aid of those emitting their semen during sleep; plastered on, they relax the genitalia, they dry up milk, they prevent maidenly breasts from growing big, and they make boys' testicles whiter" (4.78.2).

Pliny gets his information from Anaxilaus[172] who confirms some of these uses, and adds a few more. Anaxilaus wrote that if the breasts are rubbed with hemlock from adult maidenhood onwards, they will always remain firm. An application of hemlock to the breasts of women in childbed dries up their milk, and rubbed on the testicles at the time of puberty it acts as an anaphrodisiac (*H.N.* 25.154).

Hemlock was also used as depilatory to either remove all the hair, or reduce the growth (*H.N.* 30.132).

Hemlock also acted as an antidote to another poison. When rubbed onto the hands and face of those who gather rue, hemlock juice was believed to counteract rue-poisoning (*H.N.* 20.131).

5.6 TOXICITY

Pliny writes that the seed and leaves of hemlock have a chilling quality, and this was eventually what caused death; the body begins to grow cold at the extremities (*H.N.* 25.151). He warns that when hemlock is taken with wine, it is fatal. According to Pliny

---

172 Anaxilaus of Larissa was a physician and a Pythagorean philosopher. According to Eusebius, he was banished from Rome in 28 BC by Augustus on the charge of practising magic. He wrote about the magical properties of minerals, herbs and other substances and derived drugs (Taran 1970:02).

the juice causes death by thickening the blood. Its other outstanding characteristic is the appearance of spots on the bodies of those who have died in this way (*H.N.* 25.152).[173]

Theophrastus attributes the discovery of a poison which produces an easy and painless end to Thrasyas of Mantinea. He used the juices of hemlock, poppy and other such herbs, so compounded as to make a dose of conveniently small size, weighing only somewhat less than a quarter of an ounce. For the effects of this compound there is absolutely no cure, and it will keep for any length of time without losing its virtue at all (*H.P.* 9.14.8).

5.6.1 ANCIENT ANTIDOTES

Pliny advises that the fatal effects of hemlock can be warded off by using the warming property of wine before the hemlock reaches the vital organs (*H.N.* 25.152).

Several mixtures and ingredients are used as antidotes for hemlock, with wine as liquid ingredient in almost every antidote. Celsus however, prescribes the following mixture to counteract hemlock poisoning:

"*Si cicutam, vinum merum calidum cum ruta quam plurimum ingerendum est; deinde is vomere cogendus; posteaque laser ex vino dandum: isque, si febre vacat, in calidum balneum mittendus; si non vacat, unguendus ex calfacientibus est. Post quae quies ei necessaria est*" (5.27.12.B).

"If it be hemlock [poisoning], hot undiluted wine with rue should be taken in a large quantity, then the patient should be made to vomit; and after that laser[174] is given in wine; and if free from fever he should be put into a hot bath; if not free, he should be anointed with heating remedies. After this, rest is necessary".

Theophrastus tells us that pepper as well as frankincense, were used as antidotes for hemlock poisoning (*H.P.* 9.20.1) while Pliny says that storax[175] would counteract any poison of which the symptom was chilling and mentions, amongst other poisons of

---

173 See also the description of Socrates' death on p 85.

174 Silphium was a plant of the species *Asafoetida* and genus *Ferula*. Chief among its medical uses, according to Pliny, was to act as a herbal contraceptive. The reason for silphium's extinction is not entirely known. See also Plin. *H.N.* 19:15; 22.49; 22.100-106. Also Herodotus' *The Histories*, 2.161; 2.181; 2.131; 4.150-165 and 4.200-205.

175 *Styrax officinalis* L.

this kind, also hemlock (*H.N.* 24.24). Pliny also mentions the following antidotes: the cnidian berry (*Coccus cnidius*) (*H.N.* 27.70), pericarpum,[176] panaces, chironium[177] (*H.N.* 25.131) and nettle (*H.N.* 22.31).

Other remedies are unmixed wine (Diosc. 4.78.1), absinth mixed with wine (Plin. *H.N.* 27.50), neat wine (Plin. *H.N.* 23.43), and must, which Pliny considers particularly efficacious against hemlock (*H.N.* 23.30).

Pliny writes that Aristotle[178] also used a draught of woman's milk to cure the madness caused by drinking henbane (*H.N.* 28.74), but the milk of a cow (*H.N.* 28.130) or the milk of an ass neutralizes this poison (*H.N.* 28.158). Butter together with honey was also thought to neutralize the poison of hemlock (*H.N.* 28.161).

THE MODERN HEMLOCK

Conium is a genus of two species of perennial herbaceous flowering plants in the family *Apiaceae*, native to Europe and the Mediterranean region (*C. maculatum*), and to southern Africa (*C. chaerophylloides*). All parts of the plant are poisonous, though it is believed to be less concentrated in the root. It is said that, although the hemlock fruits have essentially the same active constituents as the leaves, it yields up to 1.75% coniine, which is a greater percentage than that found in the leaves (Duke 1985:140).

Hemlock is categorised by the FDA (Food and Drug administration), as one of the well-known toxic plants that are not available in retail (in the USA) (Blumenthal *et al.* 1998:335), but homeopathic websites still recommend it for several unproven uses. Although there are no published reports on the toxicity of hemlock, Pray (2006:10) aptly warns: "Absence of evidence of risk does not indicate that there is no risk".

---

176 Kind of bulb (Plin. *H.N.* 25.131).

177 Chiron's allheal (Diosc. 3.50) = *Helianthum ovatum* Duncl = *H. vulgare* Gaertn. In Pliny's Latin text (Mayhoff edition translated by Jones) two species, namely panaces and chironium are given but Dioscorides mentions only one, namely panaces chironium (Beck's translation 2005:420). It seems more likely that there was only a single known species.

178 Aristotle's *Historia animalia* contains many remedies derived from farm lore, as does the Pseudo-Aristotle *Marvellous things heard.*

5.7 MORPHOLOGY

Hemlock is a robust, biennial herb of up to 2 m in height, with stems characteristically blotched with purple or sometimes with yellow spots. The large, compound leaves have oblong, pointed segments. Small white flowers are borne in typical umbels (Van Wyk *et al.* 2002:72).

The fruit is small, broadly ovate, ridged, compressed laterally and smooth. The prominent crenate (wavy) ridges and absence of *vittae* (oil cells between the ridges) are important characteristics for distinguishing this fruit from others of the same natural order of plants (Evans 2002:389).

The entire plant has a bitter taste and gives off a disagreeable mousy odour which is especially noticeable when bruised. When dry, the odour is still foul, but not as pronounced as in the fresh plant (Van Wyk *et al.* 2002:72).

5.7.1 ONTOGENIC VARIATION

Evans reports (2002:390) daily fluctuations in the proportions of the alkaloids in the living plant. Unlike most other alkaloids, coniine does not appear to be biosynthesized in the plant directly from amino acids, but from 4 molecules which is part of acetic acid.

5.8 DISTRIBUTION

It is according to Lewis *et al.* (1977:50) found on hedge banks, in neglected meadows, on waste ground and on the banks of streams in most parts of England, occurring in similar places throughout Europe (except in the extreme northern parts), and also in temperate Asia (Usher 1974:171) and North Africa. It has been introduced into North and South America.

5.9 PROCESSING OF THE PLANT

The fresh green hemlock is employed in the preparation of Juice of Conium, Conium ointment and the green extract of Conium. Young branches and leaves should be gathered when the flowers are fully matured and the fruits are just beginning to form as they possess their greatest medicinal properties at this time. The leaves which have been removed from the branches and then dried are also beneficial. The dried

ripe fruits should be gathered before they turn from green to yellow and should be carefully dried (Grieve 1931:393).

5.10 ADMINISTRATION OF THE PLANT

Coniine is volatile, which lessens its effect when the leaves and roots are cut and dried. When it is heated, the poison becomes even more effective since the heat activates the release of the poison (Grieve 1931:393). According to Grieve (1931:393) the leaves are separated from the branches and dried before being used in tinctures. Inhalation therapy is used for asthma, bronchitis and whooping cough. It is applied locally as an anodyne (Duke 1985:139). According to Henry (1924:30) the fruit, which is the part mostly used in medicine, appears to contain the most alkaloid when the plant is three-fourths to fully grown. A preparation containing hemlock is also available in the form of an ointment (Grieve 1931:394).

In Iran, the fruits are used as an anodyne and the smoke of burnt leaves is inhaled for asthma (Duke 1985:139). The leaves are also smoked in cigarettes in Africa, and the dried, unripe fruits are used as a pain-killer and sedative (Usher 1974:171).

5.11 DOSAGE

For the relief of asthma, 1 - 3 grains of the powdered leaves are used or 5 - 10 drops of the fluid extracts of the leaves. The fluid extracts of the seeds are more potent and only 2 -5 drops are used (Grieve 1931:394).

In tinctures, the dosage slightly differs. One half to one drachma of the seed-tincture is used while 1 - 2 drachms of the leaf-juice are used. In the solid extract 2 - 6 grains are use (Grieve 1931:394).

5.12 PHYTOCHEMISTRY

Coniine ($C_8H_{17}N$) (*d*- and *l*-forms) is by far the most important constituent of hemlock. When pure, coniine is a volatile, colourless, oily liquid, strongly alkaline, with poisonous properties and a bitter taste (Henry 1924:29). Coniine has an alkyl C_3-side chain at the 2-position of the piperidine ring (Heinrich 2004:97).

Alkaloids (N-methyl-coniine ($C_8H_{17}N.CH_3$), Conhydrine ($C_8H_{17}ON$), γ- Coniceine ($C_8H_{15}N$) and ψ-Conhydrine ($C_8H_{17}ON$) are also present (Henry 1924:29), as well as other piperidine alkaloids (Van Wyk *et al.* 2004:406).

5.12.1 POISONOUS INGREDIENTS

The mono-unsaturated piperidine alkaloid γ-coniceine is the major toxin of hemlock. It is the precursor of the other alkaloids in poison hemlock, namely coniine and N-methylconiine. γ-Coniceine is seven times more toxic than coniine and also much more toxic than pseudosonhydrine and N-methylconiine, but all of these alkaloids contribute to the toxicity of the plant. It has been shown that there are rapid changes in the plant and that γ-coniceine can be converted to coniine (Van Wyk *et al.* 2002:72).

5.12.2 CONIINE

Coniine = (2S)-2-propylpiperidine, polymerises on exposure to light and air. It solidifies to a soft crystalline mass when it is cooled to -2°C and has a burning point of between 166 - 166.5°C. It is volatile in steam. It is soluble in alcohol, ether, acetone, benzene, amyl alcohol and only slightly soluble in chloroform (Budevari 2001:438) and in cold water (Henry 1924:31). Coniine is less soluble in hot water so that a clear cold solution becomes turbid when warmed (Henry 1924:31).

5.13 PHARMACOKINETICS

d-Coniine when pure is a colourless, strongly alkaline liquid, having a peculiar penetrating mouse-like odour and a burning taste (Henry 1924:31) and it is volatile (Grieve 1931:392).

5.14 PHARMACOLOGY

As a medicine, coniine is sedative and antispasmodic, and in sufficient doses, γ-coniceine and coniine produce paralysis of the motor nerve terminations (Van Wyk *et al.* 2002:72) and stimulation followed by depression of the central nervous system (Henry 1924:38). According to Van Wyk *et al.* (2004:374), coniine is an antagonist at nACh receptors. It is used as an antidote to strychnine poisoning (because it causes nausea and vomiting in the early stage of action), and in other poisons of the same

class since it is a direct antagonist of strychnine. Since it has a sedative action on the motor centres, hemlock juice was prescribed as a remedy in cases of undue nervous motor excitability, such as teething in children, epilepsy from dentition, cramps in the early stages of paralysis agitans, in spasms of the larynx and gullet and in acute mania (Grieve 1931:393), but it is not used anymore.

5.15 OTHER EFFECTS

It relieves cough in bronchitis, whooping-cough and asthma when it is used in inhalation therapy because the respiratory function is accelerated when a normal doses is administered. Narcotic poisoning may result from internal use, and overdoses produce paralysis with loss of speech. The respiratory function is generally accelerated and deepened but later becomes depressed and slow and death results from asphyxia (Follette 1992:2). The heartbeat is not affected even after the patient loses consciousness (Henry 1924:38). Hemlock was also successfully used to treat mastitis.[179] It was also recommended as an antidote for strychnine poisoning and for use in tetanus and hydrophobia (Grieve 1931:393) but it is not in use any more. In short, it is used to relieve pains and cramps, it is a sedative and extremely toxic (Van Wyk *et al.* 2004:406).

5.16 TOXICITY

The drug must be administered with care, since narcotic poisoning can be caused, which leads to paralysis (See § 5.14). The respiratory system is depressed, it results in loss of speech and death results because of asphyxia. The worst is that the mind stays clear until death, which makes this poison almost cruel - the patient knows that he is dying, but is unable to help himself or ask for help (Van Wyk *et al.* 2002:72). According to Evans (2002:506), the alkaloid coniine is teratogenic. Poisoning occurs when children use the hollow stems as "pee-shooters" and ingest small quantities of the poison (Heinrich 2004:97). Lewis *et al.* (1977:50) add that the plant is often mistaken for parsley or for anise seeds. Since the young green leaves contain the highest amount of alkaloids, people who consume it will almost certainly die.

---

[179] Mastitis is inflammation of the breast and is usually caused by infection within the breast-feeding period (Van Wyk *et al.* 2004:363).

5.16.1 MODERN ANTIDOTE

Since no specific antidote is available, prevention is the only way to deal with the production losses caused by this weed (Lopez *et al.* 2004:859). According to Grieve (1931:393), there are several household antidotes for hemlock poisoning such as tannic acid, stimulants such as coffee, emetics of zinc, or mustard and castor oil. Since the most recent research states that no antidote exists, supportive help such as artificial respiration is advisable.

5.17 CONCLUSION

The description of the **phytochemistry** (§5.12) of hemlock found in modern sources correlates to such a degree that it is possible to draw comparisons with the observations made by the ancients.

In order to **process** the drug the ancients used the dehusked stem and root, bruised it and sprinkled it on water (§5.4). There is no mention of whether it was cold or hot water but since water came from fountains or springs, it would have been cold. In modern texts we read that coniine is only slightly soluble in cold water and less soluble in hot water so that a clear cold solution becomes turbid when warmed up (§5.12.2). Assuming that they used cold water, we can conclude that the drug would have the desired effect on the patient. Since coniine is slightly soluble in water but totally in alcohol (Budevari 2001:438), coniine would have an even greater effect if it was mixed with wine as Pliny describes (see §5.4; Plin. *H.N.* 26.121).

Another method of **preparation** that the ancients used was to bruise the plant parts in a mortar, then pour water over it, strain the fluid off and keep the sediment (Theop. *H.P.* 9.8.3). Alternatively the leaves were hung over smoky must, pounded and mixed with wine or vinegar (Plin. *H.N.* 26.121) (§5.4).

A juice was also **extracted** from the leaves and blossoms and the best time to do so was when the hemlock was in flower (Plin. *H.N.* 25.152). The top foliage was also cut and pressed to obtain the juice (Diosc. 4.78.1) (§5.4). In modern preparation, all plant parts i.e. leaves, branches and flowers are used and are gathered when the flowers are fully matured and the fruits are just beginning to form, as they then possess their greatest medicinal activity (§5.9). The compounding of natural mucilage (Acacia) with opium and hemlock would assure a mild narcotic effect (although transdermal proportions remain uncertain). The generic "gum" plus the acacia-mucilage produced a good moist plaster that likely would remain near the eye throughout the night (§5.5.1.1).

Hemlock is still used today in the form of a **topical application** (§5.5 and 5.10) and as an anodyne by homeopaths since it possesses intradermal activity which results in local anaesthesia on the skin, where the coniine has a effect on the motor centres of the central nervous system. We do not use it anymore to treat any **respiratory ailment** (§5.10) (ancient catarrh (§5.5.5), but it has vasodilatory effects (§5.15). This is a valid indication, although it is not in use anymore.

The ancients used it to stop **nose bleeding** (§5.5.6) but according to modern pharmacology, it is not a valid indication since coniine has a vasodilatory effect, and exerts no constricting effects on the body (§5.15). It was also used as an ingredient in **eye-ointments** (§5.5.5). If its purpose was only to dull the pain, it is a valid indication because of its effect on the motor centres (§5.15) but if it was to clear up infection or to promote lubrication, it would not have been effective. There are a number of recipes available suggesting that the ancients often used hemlock for positive therapies, (i.e. sleep, pain, erysipelas, gout, catarrh, inflammation) and not only for **capital punishment**, rendered infamous by the death of Socrates.

Sleep was an effect of hemlock, known during ancient times and modern phyto-chemistry confirms that coniine is a sedative and an antispasmodic (§5.15).

Pain and inflammation (§5.5.2) would be relieved due to the paralysis of the motor nerve ends and depression of the central nervous system. Since it has a sedative effect on the motor centres, it acts as a local anodyne and an anti-inflammatory agent in cases of erysipelas. The sedative action is also effective for the pain caused by gout (§5.15).

Death (§5.6) can occur since hemlock is seen as a narcotic poison because it produces general paralysis and eventual death from asphyxia (§5.19).

It is remarkable that the ancients discovered the properties of hemlock as a narcotic, a poison, as well as an antispasmodic, anti-inflammatory and antidote without identifying the principle active ingredient coniine and the other alkaloids. The modern scientific description and the resultant identification of coniine reveal its dangerous and poisonous properties. Apart from its ability to induce sleep it can cause death and therefore the use of hemlock in pharmaceutics is more limited and controlled in our time.

CHAPTER 6
DATURA STRAMONIUM L.

English – Jimsonweed, Devil's apple, Devil's trumpet, Thorn apple, Belladonna, Metelnut, Deadly nightshade, Solanum

Afrikaans – Stinkblaar, Olieblaar, Olieboom, Olieneut, Steekblaar

Sotho – Lethsowe, Lethsowi, Mphufi

Southern Sotho – Lechoe, Letjoi, Mokhurana

Tonga – Zaba-zaba

Xhosa – Umhalvuthwa

Zulu – Iloqi, Iyoli

German - Tollkirschen

French - Herbe aux sorciers au de diable

Dioscorides lists a number of names for what we call thorn apple (*Datura stramonium*), suggesting that he and his sources were very familiar with the plant. He writes: "The thorn apple which some called *perseion*, other *perisson*, others *anydron*, others *pentodryon*, others *enory*, others *thryon*, and others *orthogyion*..."(4.73.1).

The more common name was *doryknion*, a term preferred by Dioscorides to Crateuas'[180] two alternatives, namely *Haliccacibon* or *calleas.*[181] The fact that Dioscorides uses three names for a single kind of *Datura* is a clear indication that it was one of the least reliable of the narcotics he or his sources knew, since it was very difficult to identify it successfully.

The plant had several synonymous names, some more descriptive than others. Ancient warriors used the juice of the plant which they called *doryknion.*[182] (Greek *dorn* = spear) to dip their spear points in before battle. The poison was freely

---

180 Crateuas was chief physician of Mithridates VI of Pontus (120 - 63 BC).
181 Diosc. 4.74
182 δόρν = spear

available since the plant grows everywhere and the ancients believed that the soldiers instantly killed whomever they injured with these spears. Those who censured the drug less severely gave it the name *manikon* i.e. "maddening"; those who, from evil motives, tried to keep its nature secret called it *erythron*, i.e. "red"; it was also called *neuras* i.e. "exciting the nerves", or *perisson* which can mean either (a) "superfluous" or (b) "extraordinary" (Jones 1951:287).

6.1 MORPHOLOGY

In spite of disagreement among modern authorities, Scarborough (2009:108) is of the opinion that there is a resemblance between the morphologies of Dioscordes' two kinds of Datura.

Beck (1995:280) writes that *doryknion* (miss-identified as *Convolvulus oleaefolius* by LSJ), is one of the species that is said to be "almost" like Datura. Interestingly enough Dioscorides does not afford *doryknion* much importance, writing just a few lines about this plant, putting it second, after the description of *strychnos manikos.* Beck (1995:280) [slightly modified by Scarborough 2009:3] translates Dioscorides' description of *doryknion* (4.74), as follows:

" [It is a] bush quite similar to a young sapling of an olive tree, and it has branches somewhat shorter than one's forearm, leaves in colour quite like those of an olive, but more slender and very much jagged, and it has a white flower. At the tips of the branches are stuffed pod-capsules, similar to a pod of chickpeas, [but the *doryknion*'s pod] has five or six smaller, smooth, globular, tough and piebald seeds about equal in size to those of the bitter vetch.[183] It has a root about as thick as a finger and in length it is about a cubit".[184]

The fact that Dioscorides puts *strychnos manikos* before *doryknion*, shows that he regarded it as more important. He also provides a fuller description and supplies more detail about the possible effects of the plant. About the morphology of *strychnos manikos*, Dioscorides (4.73) [trans. Scarborough 2009:3-4] says:

---

183 *Vicia ervilla* L. The seed of a bitter vetch was known in ancient pharmacy as the smallest seed with a diameter of 3 - 5mm (Zohary *et al.* 2000:216).

184 45.72 cm

"It has a leaf quite like that of a rocket[185], but it is larger, more resembling the leaf of the thorny plant (*akanthos*) some call *paideros.*[186] It sends up from its rootstock ten or twelve stalks to a height of about a 'fathom' [187, 188] and its head is like an olive but rougher, larger, and broader, similar to the globular fruit of the plane tree. It has a dusky flower. Pliny describes the conical seed-bag as cluster-like [seeds][189] and Theophrastus concurs in general with Dioscorides' description and adds that the seeds are round and black - ten or twelve berries (*H.P.* 7.15.4) similar to the corymbs of an ivy - soft like a grape. Its root underneath is white, thick, and hollow, and about a cubit long"[190] (Diosc. 4.73). Pliny adds that the berries ripen in November (*H.N.* 21.177).

Theophrastus knew Datura by its more general name and was also aware of distinctions between the different kinds:

"Others (plants) are found in fewer forms, as *strykhnos,*[191] which is a general name covering plants that are quite distinct; one is edible and like a cultivated plant" (*H.P.* 7.15.4). Pliny thinks that it resembles a woody shrub rather than a plant (*H.N.* 21.177).

When these variable morphologies are summarised, there emerge characteristics that point to only two kinds. Scarborough (2009:109) explains the resemblance in Dioscorides' accounts between *doryknion* and *strychnon manikon*:

"There emerge characteristics that include (*doryknion*) a resemblance to the saplings of an olive, branches that are about a foot long, leaves that are jagged, a prominent *white* flower, sometimes prickly, sometimes smooth seed-pods similar to those of the chickpea, with the capsules containing five or six piebald (that is light and dark) seeds that are small and globular; and Dioscorides' *strychnon manikon* resembles a rocket but with larger leaves similar to an *akanthos*, sends up ten or twelve root-stalks that can reach heights of five or six feet[192], soon producing 'heads' like an olive but rougher like those of a plane-tree preceded by a 'dark' flower, with the seeds in a

185 *Eruca sativa* L.
186 *Acanthus mollis* L. or *A. spinosus* L. (Scarborough 2009:115).
187 About 180 cm (LSJ, 9th ed. with supplement (1996).
188 See also Theop *H.P.* 9.11.6
189 Pliny describes it as a conical seed-bag (*H.N.* 21.177).
190 See also Theop. *H.P.* 9.11.5
191 See Plin. *H.N.* 21.177 – 179 and Diosc 4.70 – 73
192 Between 1.5m and 1.8m

'cluster' similar to that of a corymb of ivy. Combined, these morphological features suggest successive stages in the growth of *Datura stramonium* L: the flowering shoot with its trumpet-shaped white (usually) flower is that of Dioscorides' *doryknion*, as is the small, prickly pistil viewed easily once the flower is cut away, with seeds (sometimes black, sometimes piebald) shaped like tiny, roundish kidneys. The *strychnon manikon* can have flowers that are 'dark,' and the seed-pods are prickly, leaves like those of a rocket but more jagged, and reaching a height similar to the *doryknion*."

It seems therefore that ancient botanists named plants incorrectly because they were "discovered" in different stages of plant growth. Scarborough concludes that Dioscorides' *strychnos manikos* and *doryknion* are two kinds of thornapple, either *Datura stramonium* L. or one of the other species (Scarborough 2009:112).

6.2 DISTRIBUTION

Dioscorides writes that *doryknion* grows among the rocks close to the sea (4.74), while *strychnos manikos* grows in mountaincountry, in places exposed to the wind among groves of plane trees (4.75).

6.3 HARVESTING

No records on ancient harvesting were found.

6.4 PROCESSING

No specific information found on the processing of datura.

6.5 ADMINISTRATION OF THE PLANTS

A draught was prepared for oral administration (Theop. *H.P.* 9.11.5) by either bruising the bark or the root and mixing it with wine (Diosc. 4.73). Celsus writes that the ancients also applied the juice pressed from the plant directly to the scalp to treat insanity (3.18.9). For dermatologic use, for example in the treatment of callouses, an emollient was made of the plant parts for topical application (5.26.33B).

6.6 EFFECTS

6.6.1 SOPORIFIC

Dioscorides makes it clear that *doryknion* is a sleep-inducer (*hypnotikon*) (4.74). Theophrastus likewise indicates that when a draught was prepared of bruised bark soaked in wine, it induced sleep.[193]

Pliny also refers to the soporific effect of *doryknion*:

"*Quin et alterum genus quod halicacabon vocant soporiferum est atque etiam opio velocius ad mortem, ab aliis morion, ab aliis moly appelatum*" (*H.N.* 21.180).[194]

"There is besides another kind, with the name of halicacabos, which is soporific, and kills quicker even than opium, by some called morion and by others moly.[195]

6.6.2 LOCAL ANODYNE

Datura was not only used to induce sleep, but was also used as a topical anodyne for local pain relief. Celsus reports that "Hallicaccabus" (Crateuas' name for it), also acted as a local anodyne while the tannin which they contain made them astringents as well (5.20.3).

6.6.3 HALLUCINATIONS AND COMA

When Dioscorides describes the property (*dynamis*) of the *strychnos manikos* root, he remarks that a *drachma*[196] of the substance taken with wine engenders not unpleasant mental images, but if two *drachmai*[197] are quaffed, you could lose your wits for as long as three days (4.75). He warns that too large a quantity will have a fatal effect.

---

193 Theop *H.P.* 9.11.5

194 Wellman *app. crit.* 1 (p 233) suggests a common source behind this and suspects a scholiast to Nicander (*Alexipharmaca* 376).

195 *Allium moly* L.

196 3.411 g

197 6.822 g

6.6.4 PSYCHOTHERAPY

Theophrastus writes that the plant called *strykhnos* induced sleep, caused madness,[198], [199] and upset the mental powers. Celsus also refers to the use of Datura to soothe the insane. He writes that *solanum*, which the Greeks call *stryknos* is one of the plants which simultaneously "repress" (*reprimunt*) and "cool" (*refrigerant*) (2.33.2). He writes:

"*Utiles etiam in quibuscumque viribus duae herbae sunt, solanum et muralis, si simul ex utraque suco expresso caput impletur. Cum febris remisit, frictione utemdum est, parcius tamen in iis, qio nimis hilares quam in iis, qui nimis tristes sunt*" (3.18.9).

"Whatever the patient's strength, the two herbs, bitter-sweet (i.e. Datura) and pellitory, are beneficial, if the head is wetted with the juice expressed from both simultaneously. When the fever has remitted, recourse should be had to rubbing, more sparingly however, in those who are overly sad".

The following quote from Pliny's *Historiae Naturalis* proves that he obtained the same information about Datura's effects from his sources:

"*Drachmae enim pondere... imaginesque conspicuas obversari demonstrantes, duplicatum hunc modum legitimam insaniam facere, quidquid vero adiciatur ponderi repraesentari mortem*" (*H.N.* 21.178).

"... a dose of one drachma[200]... [the users are] speaking of hallucinations and realistic visions; that a double dose causes downright insanity; any repeated ingestion moreover to the dose bringing instant death".

6.6.5 APHRODISIAC

An aphrodisiac is seen as an agent that stimulates sexual excitement (Martins 2002:43). The ancients attributed an aphrodisiac effect to quite a few plants. According to Dioscorides it was believed that if the seed [of *doryknion*] was taken [as an ingredient] it acted as an aphrodisiac [*philtron*] (4.74).

---

198 Theop. *H.P.* 9.11.6
199 Theop. *H.P.* 9.19.1
200 3.411 g

The following extract from Pliny points towards a similar effect. The quotation illustrates that the ancients did not generally regard lust as an acceptable trait.

"*Drachmae enim pondere lusum pudoris*[201] *gigni dixerunt species vanas* (*H.N.* 21.178).

"For they have said that a dose of one drachma plays tricks with the sense of shame".

6.6.6 DERMATOLOGICAL EFFECTS

For erysipelas, Celsus advises blood-letting if the patient's strength permits it; then application of depressives and refrigerants, such as white-lead with nightshade juice (5.26.33A).[202] Otherwise, if the skin is hardened, pounded nightshade leaves, mixed with lard and applied, spread on lint (5.26.33B).[203]

6.6.7 PROMINENT NAVELS[204]

Celsus prescribes the following cure for a prominent navel:

"*Cicutae et fuliginis, singulorum P.*I; cerussae elotae P.*VI; plumbi eloti P.*VIII; ovis duobus, quibus etiam solani sucus adicitur. Hoc etiam diutius inpositum esse oportet*" (6.15.17.I).

"Hemlock and soot[205] 4 grms. each; white lead[206] 24 grms.; washed lead[207] 32 grms.; 2 eggs; to these nightshade juice also is added. This ought to be kept on for a long time".

6.7 DOSAGE

The following translation from Theophrastus' text gives us an indication of the amount of hemlock used to obtain the desired effect:

---

201 *Pudor* means a sense of shame, decency or good manners (Lewis *et al.* 1975:1486).

202 "*Erysipelas...oportet, si vires patiuntur, sanguinem mittere; deinde imponere simul reprimentia et refrigerantia, maximeque cerussam solani suco...*" (Cels. 5.26.33B).

203 " *aut si durior locus est, solani folia contrita suillae adipi miscenda sunt et inlita linteolo superinicienda*"(Cels. 5.26.33B).

204 Protruding navel is a large umbilical protrusion with redundant skin due to an umbilical hernia (Ikeda *et al.* 2004:105).

205 For soot, see Diosc. 5.161

206 For white lead, see Diosc. 5.88

207 For washed lead, see Diosc. 5.81

"The kind [208] which produces madness (which some call *thryoron* and some *peritton*) has a white hollow root about a cubit [209] long. Of this three twentieths of an ounce [210] in weight is given, if the patient is to become merely sportive and to think himself a fine fellow; twice this dose [211] if he is to go mad outright and have delusions; thrice the dose, [212] if he is to be permanently insane; (and then they say that the juice of centaury is mixed with it); four times the dose [213] is given, if the man is to be killed (*H.P.* 9.11.6).

Dioscorides gives a warning, saying that if too much of the *doryknion* is ingested, it kills (4.74). With his warning about *strychnos manikos*, he is more specific: four *drachmai*[214] of the substance will prove fatal (Diosc. 4.75). Theophrastus agrees with Dioscorides about the quantity which would prove fatal (*H.P.* 7.15.4).

6.8 ANTIDOTE

Dioscorides prescribes an antidote (*antipharmakon*) for *strychnos manikos*. He writes that large quantities of hydromel[215] should be taken to induce vomiting (4.75).

Must was regarded as particularly efficacious against *doryknion* when it had been used on the spear points of warriors.[216] According to Aristotle, a draught of woman's milk is a very effective antidote to *doryknion*, [217] and Pliny similarly mentions raw milk [218] and asses' milk. [219] Pliny also adds sea-urchins, a decoction of sea-crab,[220] oysters[221] or myax[222] ,[223] to the list of cures.

---

208 See Plin. *H.N.* 21.177 – 179, Diosc. 4.73
209 30 cm
210 4.3 g
211 8.6 g
212 12.9 g
213 17.2 g
214 13.664 g
215 Hydromel is a mixture of honey and water.
216 Plin. *H.N.* 23.30
217 Plin. *H.N.* 28.74
218 Plin. *H.N.* 28.129
219 Plin. *H.N.* 28.158
220 Plin. *H.N.*32.58
221 Plin. *H.N.* 32.59
222 *Myrtus axillaris* Sw.
223 Plin *H.N.* 32.95

MODERN DATURA

Except for the stimulant cocaine, all the significant tropane alkaloids are found in the potato family, the Solanaceae to which Datura belongs. The alkaloids include hyoscine (scopolamine) and (+)-hysocyamine (atropine) present in varying concentrations in different parts of the plant. It is frequently used as a popular medicine and is of considerable toxicological importance (Lewis *et al.* 1997:418). Since the concentration of the substance varies so much, overdosing is a distinct possibility - addicts can inadvertently be exposed to much higher levels of alkaloids than they anticipated.

6.9 MORPHOLOGY

Modern herbology manuals tell us that this is a "robust annual of up to 1,5m" (Van Wyk *et al.* 2004:123), branching at the apex and that the colour of the stems are green to purple. It has a whitish root with several rootlets (Evans 2002:341).

The bright, green leaves alternate, it grows up to about 25 cm in height, 15 cm in width (Williamson 2003:418), it has irregular toothed leaves which vary in size and shape (Van Wyk *et al.* 2002:102). The leaves give off an unpleasant smell when they are crushed. The leaves have a greyish-green colour when dried and are usually found broken in commercial samples (Williamson 2003:418).

The plant has solitary white to purple flowers with a tubular form (Van Wyk *et al.* 2004:123). The flowers usually grow from the center of a forked branch (Lewis 1977:54) and they have a sweet scent. It flowers in the summer and early autumn (Evans 2002:341).

The fruit is in an ovoid capsule bearing many sharp spines (Lewis 1977:54), and contains blackish, kidney-shaped seeds (Van Wyk *et al.* 2004:123). The ripe fruit of Datura, showing the calyx partly removed and the berries of *A. belladonna* are basically bilocular but the fruit of Datura becomes almost completely four-celled by the development of the false septum (Evans 2002:522).

The taste is bitter and saline. The odour is disagreeable when fresh and tea-like when it is dried (Williamson 2003:418).

The plant parts used are the leaves, flowering tops and seeds (Williamson 2003:418).

6.9.1 ONTOGENIC VARIATION

The hyoscine / hyoscyamine ratio falls from about 80% in young seedlings to about 30% in the mature fruiting plants (Evans 2002:65). Research has shown that the active concentration of the drug in the plant decreases during daytime, and increases at night. It is also less after a rainy period and increases again in sunshine (Lewis *et al.* 1997:419). It has also been established that during long exposure to intense light, the amount of hyoscine increases at the time of flowering (Evans 2002:62).

6.10 DISTRIBUTION

Today the genus is widely distributed from Eastern (Evans 2002:14) to Western Europe and extending to the Himalayas (Lee 2007:77). It also occurs in South (Evans 2002:14) and North America (Van Wyk *et al.* 2004:123), Africa and Australia (Conklin 1976:5). This cosmopolitan weed is common to waste areas, pastures and roadsides (Lewis 1977:54).

6.11 PROCESSING OF THE PLANT

In modern pharmaceutics, the leaves are mainly smoked (Holleman 1998:233), although the seeds are also macerated in tinctures and decoctions (Van Wyk *et al.* 2004:123). The leaves are poulticed or crushed and an infusion is made to gargle (Duke 1985:161).

6.12 ADMINISTRATION OF THE DRUG

Because of their anticholinergic action the leaves are burnt and the smoke inhaled to alleviate bronchospasms (Robbers *et al.* 1999:112). Duke adds (1985:161) that the leaves may be smoked in a pipe, alone, or with other herbs like belladonna and tobacco. The poulticed leaves are placed onto various kinds of cancer. Mexican Indians take the decoction made from the leaves to relieve parturition pains. Costa Ricans apply crushed leaves to tumors and gargle the mixture to relieve a sore throat (Duke 1985:161). Pulverised seeds in fermented drinks, or infusion of leaves and twigs lead to intoxication and hallucinations (Lewis 1977:402).

Homeopaths prescribe the powdered seed, mixed with butter and taken internally as a cure for impotency. The mixture is also applied to the genitals to increase sexual vigour (Lewis 1977:330). Macerated seeds in alcohol are used as an ointment for rheumatism, neuralgia, hemorrhoids and abscesses as a homeopathic cure (Duke 1985:161).

Duke, who is the author of several books on medicinal plants, writes that Datura juice prevents baldness, and he adds that the juice of the fruit relieves earache (Duke 1985:162).

6.13 DOSAGE

It is chemically calculated that the maximum daily dose of atropine may not exceed 2 mg. The prepared Stramonium BP consists of a finely powdered drug, adjusted to an alkaloid content of 0.23 - 0.27% (Evans 2002:343). In eye drops, the concentration may not exceed 3% while 0.5% is the minimum effective concentration. When patches are used which are pasted behind the ear (against motion sickness), the active ingredient is approximately 1.5% scopolamine (Van Wyk *et al.* 2004:123). The dosage of Stramonium Liquid extract can be up to 0.6 ml daily;the dosage of Stramonium Tincture is up to 6 ml daily (Williamson 2003:418). 100 mg constitutes a lethal dose for humans (Van Wyk *et al.* 2002:86).

6.14 PHYTOCHEMISTRY

All parts of the plant contain tropane alkaloids, that can induce delirium and hallucinations (Hoffmann 2003:122). The active principles are atropine, hyoscyamine (not less than 0.3% of total alkaloid content) and scopolamine (hyoscine) which are classified as anticholinergics (Sweetman 2002:463). These constituents are present in all parts of the plant, in variable concentrations (dry leaves contain 0.2 - 0.65% of tropane alkaloids, of which hyoscyamine[224] makes up not more than 70% and scopolamine 20%) (Van Wyk *et al.* 2004:123).

Evans writes that at the time of collection, hyoscyamine and hyoscine[225] are usually present in the proportion of about two parts hyoscyamine to one part hyoscine, but in young plants hyoscine is the predominant alkaloid (Evans 2002:343). The larger

---

224 For more on hyoscyamine, see §4.10; 4.12.

stems contain little alkaloid (not more that 3%), the seeds contain about 0.2% of mydriatic alkaloids. The roots have a higher proportion of alkaloids than the aerial parts (Evans 2002:343), but the leaves contain about 0.5% of alkaloids.

6.15 PHARMACOKINETICS

Atropine lacks CNS (Central Nervous System) activity because of poor penetration into the brain (Brown 1996:150). This implies that the plant is water soluble and this property protects the brain against the active principles which cannot penetrate the blood-brain-barrier. Tropane alkaloids are usually fat soluble and are readily absorbed through the skin (Lewis 1977:419).

6.16 PHARMACOLOGY

The complete ester of tropine and tropic acid is essential for the antimuscarinic action of atropine, since neither the free acid nor the base exhibits significant antimuscarinic activity (Brown 1996:149). Atropine and scopolamine paralyse the parasympathic nervous system (antispasmodic effects) by blocking the action of effector cells of the acetylcholine released at nerve endings. It also stimulates the central nervous system (Dreisbach 1987:346).

Atropine competitively inhibits the action of acetylcholine (ACh) at the acetylcholine receptor in the nerve synapse, thereby preventing the parasympathetic nervous system from sending out electrical nerve impulses. The parasympathetic nervous system regulates non-volitional/subconscious activities (such as sweating, breathing, and heart rate) and when it is prevented from sending out signals, the heartbeat and breathing become extremely irregular. It is known that atropine has anticholinergic activity - e.g. it blocks constriction of the iris with resistant, mydriasis results (Brown 1996:150).

Hyoscine lacks the central stimulant action of atropine; its sedative properties make it effective in the control of motion sickness. Hyoscine hydrobromide is employed in preoperative medication, usually with papaveretum, some 30 - 60 minutes before the induction of anaesthesia (Evans 2002:344).

---

[225] For more on hyoscine (scopolamine), see §4.10.2.

6.17 OTHER USES

Atropine and scopolamine differ quantitively in antimuscarinic actions because of the difference in permeability. Scopolamine has prominent central effects at low specific doses because of its ability to cross the blood-brain-barrier, while atropine lacks this ability (Brown 1996:150). This drug is also successfully used in conditions that include neuralgia,[226] chronic rheumatism, lumbago,[227] myalgia,[228] pleurisy,[229] pulmonary tuberculosis and mastitis[230] (Lee 2007:79). The daturine alkaloids also cause cycloplegia,[231] scopolamine prevents motion sickness, and it is used in combination with morphine in obstetrics to induce "twilight sleep". It is also used in criminology as the so-called "truth-drug" (Avery *et al* 1959:51), because it induces disturbed consciousness and at the same time causes loss of short term memory (twilight sleep) (Martin 2002:712). In Europe the seeds and plant extracts were used in the treatment of mania, epilepsy, melancholy, rheumatism, convulsions and madness (Lewis 1977:167). Datura causes dryness of the mouth; this property can be used to control excessive salivation, for example in Parkinson's disease (Williamson 2003:418).

Atropine is used today in a sulphate form, in eye drops or intravenously, to stimulate the central nervous system and inhibit the nerve endings of the secretory glands secretory glands' nerve endings (SAMF 2004:513).

Hyoscine, in butylbromide form is mainly used for its antispasmodic action of the gastrointestinal, biliary and genitourinary tracts. Oral absorption is poor and duration of action brief. CNS effects include drowsiness and fatigue. A preparation containing the crude form of the purified active ingredient in South African pharmacopoeia is Buscopan® (SAMF 2006:48).

6.18 TOXICITY

High doses of atropine lead to restlessness, irritability, disorientation, hallucinations and delirium. Scopolamine in therapeutic doses causes CNS depression, manifested

---

226 A severe burning or stabbing pain often following the course of a nerve (Martin 2002:464).
227 Pain in the lumbar or loin region, of any cause or description (Martin 2002:400).
228 Pain in the muscles (Martin 2002:448).
229 Inflammation of the lung-pleura, often due to pneumonia (Martin 2002:542).
230 Inflammation of the breast, usually caused by bacterial infection via damaged nipples (Martin 2002:414).
231 Paralysis of the ciliary muscles of accommodation in the eyes (Martin 2002:172).

as drowsiness, amnesia, fatigue, and a dreamless sleep (Brown 1996:150). Contact dermatitis also often occurs (Lewis 1977:86).

Human poisoning by Datura is due mostly to the seed (commonly known as "malpitte" in Afrikaans) (Van Wyk *et al.* 2002:86). The chief constituents of the leaves, unripe capsules and especially the seeds are scopolamine and largely L-hyoscyamine. Even small amounts of leaves or seeds can be fatal (Lewis 1977:54). Poisoning by the leaf is much less common (Watt 1963:942). Accidental inclusion of the seed in foodstuffs has caused poisoning (Watt 1963:949) and it has happened that children sucked the nectar from the flowers. The seed, which has been broken or powdered, produces more rapid effects. The seed contains less active principals than the leaf, stem and root (Watt 1963:950). The leaves also cause poisoning when they are accidentally collected as wild spinach (in the Tswana tradition known as "marogo") The marogo (Tswana) dry leaf in South Africa has yielded up to 0.36% of alkaloids, of which the chief component is hyoscyamine (Watt 1963:952). Hutchings reports (1996:280) that there was a tragic episode of poisoning amongst the Zulu people after they had cooked the leaves of Datura to eat as vegetables.

Symptoms of belladonna poisoning are the same as those for atropine (a tropane alkaloid), and include dilated pupils, tachycardia, hallucinations, blurred vision, loss of balance, a feeling of flight, staggering, a sense of suffocation, paleness followed by a red rash, flushing, husky voice, extremely dry throat, constipation, urinary retention, and confusion. The skin can completely dry out and slough off. Fatal cases present with a rapid pulse that turns feeble (Lee 2007:80).

Due to the extremely high risk of overdosing, many deaths and hospitalisations are reported from recreational use. The effects of Datura have been described as a living dream: the patient loses and regains consciousness and converses with imaginery or absent people, etc. The effects can last for days. Very few other substances produce the same effects as tropane alkaloids, i.e. very vivid hallucinations and an inability to distinguish between real and unreal stimuli (Hoffmann 2003:122).

6.18.1 MODERN ANTIDOTE

Tincture of belladonna contains 30 mg of atropine alkaloids per 100mL. The fatal dose of atropine (or scopolamine) in children may be as low as 10mg. (Dreisbach 1987:345). In case of poisoning it is necessary to delay absorption by the adminis-

tration of activated charcoal. Physostigmine or pilocarpine is used intravenously as antidote (Dreisbach 1987:37).

6.19 CONCLUSION

Scarborough concludes that Dioscorides' *strychnon manikon* and *doryknion* are two kinds of thornapple, either *Datura stramonium* L. or one of the other species (Scarborough 2009:112). Modern **morphological descriptions** (§6.10) of Datura indicate that the descriptions found in ancient sources probably refer to different stages of the plant's growth (§6.10). Ancient and modern sources concur in their description of the jagged leaves, the white flowers that grow out of a forked branch and the fruit which is protected by a thorny capsule.

In order to **administer** Datura (§6.6) the ancients prepared a decoction of bruised bark or roots in wine. The juice was applied to the scalp to treat insanity and a topical application was also used to treat callouses. Today (§6.13) the leaves are mainly smoked and used for inhalation-therapy, although they are also placed on the skin as a topical application, and the leaves are used to make a decoction with which the patient then gargles. Another decoction which is made from the pulverised seeds or an infusion of leaves and twigs is taken orally, and the fruit juices are also used to gargle with. Where the ancients (§6.6) mainly used the juice or bruised bark and roots as topical application for insanity and callousus, the modern herbalists prescribe the leaves, seeds and juice as gargle-mixture and the leaves are smoked as part of inhalation therapy (§6.13).

The alkaloids in different plants have more or less the same effects, and it must have been rather difficult in antiquity to know exactly which plant caused delirium, sleepiness or even death. This is one of the reasons why nightshade is confused with the white variety of mandrake.

The ancients used Datura as **soporific** (§6.6.1) and **local anodyne** (§6.6.2). Since atropine is water-soluble, it has a poor ability to penetrate the blood-brain barrier. This implies that it would not produce anaesthesia, since it is not such a strong narcotic drug (§6.16). The atropine and scopolamine block the action of effector cells of acetylcholine, which has a paralysing effect on the nervous system. Hyoscine also exerts sedative effects (§6.17), thus the use of Datura as a soporific and local anodyne in antiquity is valid and the treatment was most probably successful.

Datura-juice was applied to the scalp of **insane people** to calm them. One of the side-effects which was reported was **hallucinations** (§6.6.3). This was due to the stimulation of the central nervous system. Scopolamine induces disturbed consciousness but the hallucinations are mainly caused by a very high dosage which also results in a dreamless sleep (coma) (§6.17). Other **side-effects** of Datura are drowsiness, fatigue and depression of the central nervous system (§6.18). All these effects are useful to calm an insane patient. Topical applications to the skin is a successful type of administration, since absorption of drugs through the skin is rapid (§6.18). Since no metabolism of the drugs takes place in the liver, its bioavailability is much higher than in the case of oral administration.

Contact dermatitis is a known side-effect, due to the scopolamine (§6.18). No modern texts ascribe a dermatological property to Datura. No explanations are also found for datura as **aphrodisiac** (§6.6.5) or for the cure of **protruding navels** (§6.6.7). In modern pharmacology, the hyoscine as active ingredient has anti-spasmodic effects and atropine is successfully used in eye-drops. There are a few more indications, (see § 6.17) for which Datura is known, like neuralgia, chronic rheumatism, lumbago, myalgia, pleurisy, pulmonary tuberculosis and mastis, cycloplegia and motion sickness. It is also used in criminology as so-called "truth-drug" because it induces disturbed consciousness and at the same time causes loss of short term memory (twilight sleep).

Even though Datura was used for ages as hallucinogenic, anodyne and even soporific, it is still of great importance to remember that it is a poison and not only relieved pain during ancient surgery, but also killed a number of people.

Since the use of Datura goes back such a long way, the question arises how ancient herbalists determined the correct dosage. The most obvious answer would be trial and error, although they also lived in close proximity to nature and probably observed the effects that different plants had on animals. Tolerances develop easily with regular use of this soporific, an indication that this is not such a harmless hallucinogenic plant as one may think.

According to Theophrastus the ancient **dosage** was 4.3 g, 8.6 g caused hallucinations, 12.9 g caused permanent insanity and 17.2 g was enough to cause death (§6.7). It is chemically calculated that the maximum daily dose of atropine may not exceed 2 mg, although (Van Wyk *et al.* 2002:86) writes that 100mg constitutes a

lethal dose for humans (§6.13). It is clear that the ancients prescribed dosages that were almost 4 times larger than that which modern pharmacology considers to be safe. We can conclude that the constitution of people was either much stronger in ancient times than in the 21st century, or the translators were not accurate when converting the amounts mentioned in the ancient texts.

The side-effects which have been mentioned and the distinct possibility of accidental poisoning by Datura, explains its somber reputation and its association with the devil (it is also called Devil's apple). It is not an innocent herb at all, even when taken in moderate doses.

CHAPTER 7
HELLEBORUS CYCLOPHYLLUS L.

English - Hellebore, Christherb, Christmas Rose

Afrikaans - Nieskruid

Hellebore has many common names: Pliny tells us that it was called *"veratrum"* in Italy (*H.N.* 25.52), and according to Dioscorides and his sources the black hellebore was known as *melampodion, ectonon*[232] and *polyrrhizon* (4.162).

It probably obtained the name "Christmas Rose" because of the white blossoms it bears in winter. The species is called "black" because of the dark-coloured rootstock (Grieve 1931:388).

According to both Pliny and Dioscorides who were again probably using a common source, one kind of hellebore, *melampodium,* derives its name from a skilled diviner, a certain Melampus[233] (Plin. *H.N.* 25.149; Diosc. 4.162). Pliny, as well as Dioscorides tell the same story, namely that Melampus' she-goats were purged after grazing on the plant, and when the daughters of Proetus drank the goats' milk, they were, in turn, cured of their madness (Plin. *H.N.* 25.147; Diosc. 4.162). Theophrastus proves the early origin of the story: he mentions that even the black one is called the 'hellebore of Melampus' since he was the first to cut it and to discover its uses (*H.P.* 9.10.4).

The ancients used black hellebore to fumigate and cleanse houses (Diosc. 4.162.4) and they sprinkled it on their sheep while saying a formal prayer (as part of a purification ritual) (Plin. *H.N.* 25.149). In modern times we read that it is mainly the white hellebore that is used as insecticide (Evans 2002:392).

The elaborate precautions prescribed for those who had to take the drug, indicate that the ancients regarded the white variety as far more potent than black hellebore

---

232 See Theop. *H.P.* 9.10.4 and Diosc. 4.162

233 According to Beck (2005:312), Melampus was reputed to have cured the daughters of Proetus from the madness they suffered because of some impiety they committed against Dionysus or Hera. He kept goats in Messenia, where he settled coming from Thessaly and was known for his prophetic powers.

(Plin. *H.N.* 25.56). Pliny describes the use of hellebore as a poison: mixed with pearl barley it would kill rats and mice, while white hellebore mixed with milk and sprinkled over flies was an effective insecticide. Despite these lethal properties Pliny tells how the Gauls used hellebore as a meat tenderizer! They dipped their arrows in hellebore when hunting, because they believed that the meat around the arrow-wound tasted more tender (*H.N.* 25.61).

In contrast to its use as poison to get rid of flies, Pliny writes that, according to folklore, hellebore could revive reptiles. When a dead scorpion was smeared with white hellebore, it became alive again (*H.N.* 25.122). Pliny also tells us that hellebore is good for sea-sickness and a variety of ailments to the head, eyes, and chest, as well as for all complaints for which hellebore is administered (*H.N.* 31.63). This ties up with the ancients' belief that vomiting and purging of the bowels, provided relief from just about any sickness - a treatment still adhered to in some quarters!

The ancients believed that regular use of the drug could bring about immunity to its effects. Theophrastus tells us about a certain Thrasyas,[234] (cunning in the use of herbs), who consumed whole bundles of hellebore and yet experienced no harmful effects (*H.P.* 9.17.1). In the case of Thrasyas, his constitution had accepted the drug, had prevailed over it and no longer experienced its poisonous effects. Theophrastus writes that Thrasyas found that the same substance could be poisonous to one person, and not to another; thus he distinguished between different constitutions, and he was able to tell the differences. The Chian[235] Eudemus, vendor of drugs, would experience no effect before sunset if he drank a moderate dose of hellebore, and he proved resistant[236] to its effect[237] (*H.P.* 9.17.2). One draught of hellebore would not purge him and on one occasion he said that in a single day he took twenty two draughts in the market-place as he sat at his stall, and did not leave the place till it was evening. Afterwards he went home and had a bath and dined, and he was not sick (*H.P.* 9.17.3).

---

234 Apparently a rootcutter (*rhizotomoi*) or a student of Theophrastus.

235 A resident of the Island of Chios.

236 One gets an acquired immunity when the body is getting used to some drug. This is what supposedly happened to Eudemus: he got used to the drug and that is the reason why he did not get purged of a moderate dose.

237 See also Apollonius, *Hist. Mirab.* 50.

7.1 MORPHOLOGY

The white and the black hellebore appear to have nothing in common except the name. But the sources also differ in their description of the two plants. Theophrastus says that they are alike and differ only in colour, the root of the one being white, of the other black; some however say (folklore) that the leaf of the 'black' is like that of bay, that of the white like that of the leek, but that the roots are alike except for their respective colours (*H.P.* 9.10.1).

Pliny's account of the two kinds differs from that of Theophrastus.

"*Hoc radicibus tantum intellegi tradunt plerique, alii folia nigri platano similia sed minora nigrioraque et pluribus divisursis scissa, albi betae incipientis, haec quoque nigriora et canalium dorso rubescentia, utraque caule palmeo ferulaceo, bulborum tunicis convoluto, radice fimbriata ceparum modo*" (*H.N.* 25.48).

"The difference, most authorities say, applies only to the roots, others say that the leaves of black hellebore are like those of the plane[238], but smaller, darker and with more indentations; that the leaves of white hellebore are like those of sprouting beet, but also darker and turning to red on the underside of its grooves, and that both have a stem a span[239] high, resembling that of fennel-giant , wrapped up in the outer layers like those of bulbs, and with a root, fringed like the roots of onions".

7.1.1 THE ROOT

Theophrastus describes the plant as having numerous roots, but only the slender ones are harvested and used for medicinal purposes (*H.P.* 9.10.1): "Any root, they say, deteriorates if one lets the fruit grow to maturity and ripen. In like manner the fruit will be less healthy if you drain the root of its juice. In general roots with medicinal properties do not have the juice of their roots taken, and only those whose seeds are medicinal are thus treated.[240] But some say that they use the roots for choice, because the fruit is too powerful for the human body to bear"[241] (Theop. *H.P.*

---

238 The tree *Plantanus major* L.

239 180cm (Scarborough 2009:11).

240 This means that the roots that were used for medicinal properties, were not drained. But if they determined that the roots with the seeds had the medicinal properties, they drained the roots.

241 According to the folklore ("they say"), they would always use the roots rather than the seed because the seed are considered too powerful on the body.

9.14.4). Dioscorides adds that the roots are black and slender, seemingly hanging from an onion-like little head (4.162.1).

7.1.2 THE FRUIT

It seems that the fruit of hellebore closely resembled that of the sesame plant. Both Dioscorides and Theophrastus refer to the drug *sesamoiedes* [242] which was made from hellebore, and which derived its name from this similarity (Theop. *H.P.* 9.14.4; Diosc. 4.162.1). According to Dioscorides it was especially popular amongst the people of Anticyra (4.149). The flowers are white, inclining to purple, resembling grape clusters in configuration, and containing fruit, much like safflower (4.162.1). Dioscorides instructs that the pith of the fruit be removed in the same way as the pith[243] of the white hellebore (4.162.4). Although instructions are given for the removal of the pith of the fruit, there is nowhere any specific instruction on how to remove the pith.

7.1.3 THE STEM

The sources describe the stem of the both varieties of hellebore as similar to that of asphodel and as being very short (Theop. *H.P.* 9.10.1; Diosc. 4.162.1) and hollow (Theop. *H.P.* 6.2.9).

7.2 DISTRIBUTION AND HARVESTING TIME

According to Theophrastus, hellebore is ready to harvest in autumn and past its best when spring comes (*H.P.* 9.19.2). This accords well with Theophrastus' assertion that the people of Mount Oeta gathered it for the meetings of the Amphictyons, since these meetings were apparently held at Thermopylae during autumn and sometimes in spring. The meetings would present a good opportunity for buying and selling hellebore (*H.P.* 9.10.2).

Dioscorides writes that hellebore grows in rough, hilly and very dry places (4.162.1). The black variety grew over a wide area, and was found in Boeotia, in Euboea and in

---

242 The "-oie-" insertion of the word *sesamoiedes* means "some like" or "look like". Thus it means that it is similar to sesame.

243 Meaning the middle of something i.e. fruit, seed, dehusked part of the stem or root.

many other places; but he says that the best quality was to be found on Mount Helicon (4.162.2), a mountain which was generally known for its generous yield of medicinal herbs. Quite a few authors attest to the fact that hellebore grew in the greatest abundance on mount Oeta, and especially on the part known as Pyra (Theop. *H.P.* 9.10.2; Plin. *H.N.* 25.49). Apart from Mount Oeta which provided the best crop, the white variety also occurred in Pontus, Elea and Malea (Strabo 9.3.3, Theop. *H.P.* 9.10.3).

Both Theophrastus and Pliny regarded the hellebore which came from Parnassus and Aetolia as of an inferior quality. It was common in these parts and since it looked exactly like the hellebore of good quality, people bought and sold it without knowing the difference. However it was tough and exceedingly harsh and did not exhibit the same medicinal properties (Theop. *H.P.* 9.10.4). Pliny attributes the poorer quality to the fact that the hellebore of Parnassus was adulterated by the hellebore of the neighbouring country, Aetolia (*H.N.* 25.49).

7.2.1 PLANT PARTS USED

Dioscorides advises that one should choose the kind that is sturdy and fleshy, with a thin innermost part, and with a sharp, hot taste (4.162.2). Pliny writes that both kinds of hellebore were grounded to powder, either by themselves or combined with the radicula[244] (*H.N.* 25.53). Thus only the slender lower and shorter roots of the hellebore were used since the thick upper part (rhizome) which forms a kind of head was believed to be useless. Theophrastus writes, and Pliny confirms, that this part was only given to dogs in order to purge them (Theop. *H.P.* 9.8.4; Plin. *H.N.* 25.53).

According to the ancient authors some roots keep for a longer and some for a shorter time, but it was generally believed that Hellebore retained its usefulness for as long as thirty years (Theop. *H.P.* 9.14.1; Plin. *H.N.* 25.53). Theophrastus also notes that not only the whole hellebore plant had medicinal properties, but also in particular the fruit, the roots and their juices (*H.P.* 4.5.1), and confirms that the fruit was used as a purge (*H.P.* 9.9.2; see also Diosc 4.108, 109, 162).

---

[244] I.e. root.

In Pliny's time, the folk medical practitioners administered the shoots themselves, just as they were, and chose those that grew from the roots with the thickest skin. The best hellebore had a sharp, hot taste, and produced a powder when broken (*H.N.* 25.53).

Pliny describes the following method of processing and administering: hellebore was cut with scissors ("*incisum forficulis*"), and put through a sieve; the skin which stayed behind was used to empty the stomach, while the soft part which had passed through was given to stop the vomiting when the purging was too violent (*H.N.* 25.58).

7.2.2 OBTAINING THE PLANT

Pliny and Dioscorides report on the custom to draw a circle around the black hellebore and to cut it with a sword, facing towards the east while praying. Pliny adds that the prayers were to Apollo[245] and Aesculapius,[246] who had to grant permission to cut it (Plin. *H.N.* 25.50; Diosc. 4.162.4). Theophrastus also mentions precautions which were to be observed by the harvesters. One had to look out for an eagle on the right and on the left; for if the eagle of a cutter came near, that person might die within the year since the eagle brings death if it should witness the digging of hellebore (Theop. *H.P.* 9.8.8; Diosc. 4.162.4).

Both Pliny and Theophrastus describe the cutting process used to procure the white hellebore and agree that it was also not easy to gather this variety: "It is very oppressive to the head unless garlic is eaten beforehand, wine swallowed every now and then and the plant dug up quickly" (*H.N.* 25.50). Theophrastus adds that the root-cutters must cut the plant quickly because the smell "makes the head heavy". He also recommends garlic with a draught of wine afterwards as a precaution (Theop. *H.P.* 9.8.6; Diosc. 4.162.4).

7.3 PROCESSING THE PLANT

Both Pliny and Dioscorides report that the root keeps so well because it contains a lot of moisture (Diosc. 4.150, Plin. *H.N.* 20.5). According to Pliny, placing the hellebore amongst ashes will not even ensure that it dries out. He describes the processing of

---

245 Apollo was the many talented god of the arrow (i.e army), prophecy, music, intellectual pursuits, healing, music, plague and sometimes, the sun.

246 Aesculapius (Greek Asklepios) was the god of medicine.

the plant as follows: "The physicians of the ancient days used to choose the root with the most fleshy skin, thinking that the pithy part they obtained from such was more delicate. This they used to cover it with moist sponges, and when it swelled they would split it lengthwise with a needle; then they would dry the thin strips in the shade, and so use them" (*H.N.* 25.53).

7.4 ADMINISTRATION OF THE DRUG

Dioscorides explains that on its own it is an effective plaster and boiled in vinegar it is used as a mouthwash (4.162.3). Hellebore is also inserted as an anal suppository, and is used to cleanse fistulas by inserting it (the suppository) into them and then removing them again after the third day.[247] It is similarly inserted into the ear of the hard of hearing and left there for two or three days (Diosc. 4.162.3). According to Celsus it should be inserted into the nose to induce sneezing (5.22.8), also a result when hellebore is burnt, since burnt hellebore gives off an offensive odour (3.20.2). Celsus also advises that if a patient will not take the hellebore in a draught, it should be put[248] into his bread to deceive him the more easily (3.18.20).

7.4.1 PRECAUTIONS

Pliny gives advice on how to use the hellebore. He writes:

"*Cavendum est felici quoque cura ne nubilo die detur, impetibiles quippe cruciatus existunt. Nam aestate potius quam hiem dandum non est in dubio. Corpus septem diebus ante praeparandum cibis acribus, abstinentia vini, quarto et tertio die vomitionibus, pridie cenae abstinentia. Album et in dulci datur, aptissime vero in lente ad pulte. Nuper invenere dissectis raphanis inserere helleborum rursusque conprimere raphanos, ut transeat vis, atque lenimento dare. Reddi post quattuor fere horas incipit. Totum opus septenis peragitur horis*" (*H.N.* 25.59).

"Care must be taken, even with successful treatment, not to administer hellebore on a cloudy day; for to do so is followed by unbearable torture. Indeed, there is no doubt that summer is a better season to give it than winter. For seven days previously the body must be prepared by acrid[249] foods and by abstinence from wine; on the fourth

---

247 The idea was to remove the suppository after the third day. This was enough time for the fistula to shrink.
248 Probably either baked inside the bread or pressed into it before giving it to the patient to eat.
249 *Acribus* = sharp taste or pungent (Jones 1916:179).

and third days before, an emetic must be taken, and on the preceding day there should be abstinence from dinner. White hellebore is given even in a sweet medium, although most suitably in lentils or pottage. Recently the method has been discovered of splitting radishes together again, so that the property of the purge penetrates them; the hellebore is thus administered in a modified form. Vomiting begins after about four hours, and the whole business is over in seven".

Pliny also warns that hellebore should not be prescribed:

1. for old people or children
2. for those who are soft and effeminate in body or mind
3. for those who are thin or delicate
4. for women
5. for the agitated
6. when the hypochondrium[250] is ulcerated or swollen
7. when the patient is spitting blood, since hellebore worsens this condition

when the patient has pain in the side or a sore throat (*H.N.* 25.61).

7.4.2 HELLEBORE WINE

Pliny reports that Cato[251] made hellebore wine by using black hellebore. Three ounces was pounded and thrown into a gallon and a half of wine to ensure that the wine also tasted of hellebore (*H.N.* 14.110). Similarly in Thassos, they planted the hellebore among the vines, and this caused the wine to act as a purgative (Diosc. 4.162.4), and according to Pliny it could even induce abortion (*H.N.* 14.110).

Dioscorides gives the following recipes on how to prepare wine flavored with hellebore:

"Wine flavoured with hellebore. Place 12 *drachmai*[252] of ground black hellebore, wrapped in loosely woven linen cloth, in one *chous*[253] of must diluted with sea water; decant when it bubbles up. Or place in one *chous* of must that was not diluted with sea water 15 or 14 *drachmai*[254] of black hellebore coarsely crushed and after a few

---

250 The upper lateral portion of the abdomen, situated beneath the lower ribs (Martin 2002:335).
251 Pliny talks about the native folklore in Italy as seen by Cato. *cf.* Cato *De re agricultura* 114 [ed. and trans. by Dalby 1998:176-177].
252 40.932 g
253 3.282 litres
254 Between 45.948 g and 51.165 g

days strain and use. For loosening the bowel, offer [a person] one *cyathos*[255] to drink with water after the bath when they vomited after dinner" (5.72.1).

"Or, having sifted 20 *drachmai* [256] of hellebore, 12 *drachmai* [257] of camel hay, and 13 *drachmai* [258] of Syrian base horehound, place them wrapped in a linen cloth in 14 *cotylai* [259] Coan wine for 40 days. Then strain and give three *hemicotylia*[260] to drink. Or macerate in one *ceramion* [261]of must and two *xestes* [262]of boiled sea water for 40 days one half *litra* [263] white hellebore, then after straining, use. Or soak for 15 days in 12 *cotylai* [264] must [265] 12 *drachmai* [266] hellebore and four *drachmai* [267] soda, then filter and use after six months. This wine also causes miscarriages" (5.72.2).

"Or take one *metretes* [268] of must made from grapes that were dried in the sun and place 20 *drachmai* [269] chalk into the wine, and leave it for two days, then drop in a bag of 30 *drachmai* [270] black hellebore, 30 *drachmai* camel hay, 30 *drachmai* sweet flag, half a *choinix* and a quarter[271] juniper berries, and suspend[272] one *drachma* [273] each of myrrh and saffron wrapped in a linen cloth for 40 days; then filter and give three or two *cyathoi*[274] to drink diluted with water. It purges from childbirth [275] and miscarriages, it destroys embryos / fetuses, and it is good for uterine suffocation" [276] (5.72.3).

---

255 0.0456 litres
256 68.22 g
257 40.932 g
258 44.343 g
259 3.836 litres
260 Half of a cotyle: 0.137 litres
261 26.260 litres
262 1.094 litres
263 163.725 g
264 3.288 litres
265 Must in wine production is known as the grape skins that are scraped off the top inside the vat.
266 40.932 g
267 13.644 g = *Caryon basilikon*
268 39.36 litres
269 68.22 g
270 102.33 g
271 0.1368 litres or 0.0912 litres
272 The only way to suspend the myrrh and saffron was probably to produce an oil from the saffron by heating it and pressing the oil out under pressure and to melt the myrrh in order to make it usable. Thus, with the saffron oil and the melted myrrh which are soluble in alcohol, it is possible to make a suspension.
273 3.411 g
274 0.0912 litres or 0.1368 litres
275 The remnants of childbirth, i.e. afterbirth.
276 Also known as the "wandering womb". This means that a woman's uterus is like an animal that will hunt until he gets something (i.e. the uterus will keep wandering until it gets pregnant). It thus means that the uterus suffocates because of longing for a child.

7.5 EFFECTS

7.5.1 SLEEP

Although hellebore is regarded as a narcotic, the following extract of Pliny is the only reference found in the ancient sources which specifically refers to its sleep-inducing properties.

"*Farina eorum per se et mixta radiculae qua lanas diximus lavari sternumentum facit, amboque somnum*" (Plin. *H.N.* 25.53).

"Both hellebores when ground to powder, either by themselves or combined with that of radicula,[277] with which I said wool is washed, cause sneezing, and sleep".

White hellebore is prescribed for unseasonable[278] sleep (*intempestivas somni*) (Plin. *H.N.* 25.56).

7.5.2 ARTHRITIS AND GOUT

Pliny reports that black hellebore is specifically used for chronic gout and diseases of the joints (*podagris veteribus, articulariis morbis*) (Plin. *H.N.* 25.54), while white hellebore helps for affections related to gout (Cels. 3.21).

7.5.3 TOOTHACHE

The ancients believed that boiled in vinegar and used as a mouthwash, hellebore would ease toothache. It was mixed with putrefactive[279] medications, and with barley meal and wine it provided a useful plaster (Diosc. 4.162.3). Pliny agrees that white hellebore would relieve toothache and that the application of hellebore would facilitate the extraction of teeth (*H.N.* 32.79).

---

277 The little roots of the plant.

278 Scarborough suggests that in this context Pliny is likely to say that hellebore can function in the way we use coffee. The word "unwelcome" would be a better translation than "unseasonable".

279 The decomposition of protein. Especially the typical anaerobic splitting in the case of problems caused by bacteria and fungi with the formation of foul-smelling incompletely oxidised products (Martin 2002:576).

7.5.4 LETHARGY

It was also used in a remedy for lethargy. Celsus describes the condition of lethargy (cured by hellebore) as follows:

"... in hoc marcor et inexpugnabilis paene dormiendi necessitas. Lethargum Graeci nominarunt. Atque id quoque genus acutum est, et nisi succurritur, celeriter iugulat" (3.20.1).

"...in this disease there is a pining away, and an almost insurmountable need of sleep. The Greeks name it lethargy. And it also is an acute sort, and unless remedied, quickly kills".

It was the sneezing[280] which hellebore induced, that relieved lethargy[281] (Cels. 3.20.1). To induce sneezing, a mixture of powdered hellebore and pepper was inserted into the nose (Cels. 5.22.8). Sneezing was also induced when the offensive odour of burnt hellebore was inhaled (Cels. 3.20.2). It was white hellebore of the best quality that caused the patient to sneeze most quickly.

7.5.5 EPILEPSY

Hellebore was especially employed in cases of mental excitement and as a treatment for the insane. Celsus advised that it be given to people with black bile and to those who suffer from insanity combined with melancholy (2.12.1.B). It was also prescribed for chronic and violent diseases where fever did not occur, like epilepsy (2.13.2). White hellebore was used to induce vomiting when a patient suffered from "dog spasm"[282] (4.3.1).

Celsus explains epilepsy as follows: "Now sometimes there is a spasm of the sinews when the man falls down, sometimes there is none. Some try to rouse the patients as is done in the case of those affected by lethargy. If a man falls in a fit without the

---

280 Pharmacologically the relief (although only in the short term) which sneezing provides from lethargy can be explained as follows: The sneezing causes the patient to wake up because it causes a higher blood flow and higher blood pressure. This results in a higher concentration of oxygen to the brain because of the expanded capillaries.

281 Celsus writes that lethargy is an acute affection which corresponds with that of pneumonia with serious complications such as remittent fever. The term *letharga* was applied very variously. (Cels. 3.20.1 footnote a, Vol.1 p. 308). See also Horace *Sat.* 2.3.145. According to the Oxford medical dictionary, lethargy is "mental and physical sluggishness; a degree of inactivity verging on the unconsciousness" (Martin 2002:389).

282 Dog spasm is seen as a functional disorder with cynic spasm and no pain is present (Spencer 1953:368).

addition of spasms, certainly he should not be bled; if there are spasms, at any rate he should not be bled unless there are other indications for the bleeding" (4.3.1).

Marcus Livius Drusus[283] was on the island of Anticyra when he was cured of epilepsy[284] after using hellebore (Plin. *H.N.* 25.52).

7.5.6 PSYCHOLOGICAL ILLNESSES

Celsus believed that hellebore would cure giddiness, melancholia, insanity and wild distraction (3.21) and that black hellebore was also a cure for paralysis, madness and dropsy without fever (Plin. *H.N.* 25.54).

"There is another sort of insanity, of longer duration because it generally begins without fever, but later excites a slight feverishness. It consists in depression which seems caused by black bile[285], but if anything prohibits blood letting, a clearance by white hellebore and a vomit is advised" (Cels. 3.18.17). Celsus advises, that for depression, black hellebore should be given as a purge, but for hilarity, white hellebore as an emetic, for if the patient has well purged himself, he will in great measure relieve himself of his malady (3.18.20).

7.5.7 PURGE

Theophrastus regarded hellebore as the most effective of all drugs for the inducement of vomiting and to bring about a thorough purge in this way. According to him, this effect was hellebore's most important characteristic (*H.P.* 9.14.2).

Celsus, like the Hippocratic writers, used the rhizomes and rootlets as drastic purges[286] (Cels. 2.12.1), and as emetics. He also purged a patient who suffered from elephantiasis[287] with hellebore (Cels 3.25.1).

---

283 He was tribune of the people 91 BC.

284 See also Plin. *H.N.* 25.60

285 Celsus believed that black bile induced the diseases classified under melancholia. Black bile is the residues from the formation of blood in the liver which were supposed to pass back by the splenic vein to the spleen which then passed them on by short veins into the stomach whence they were evacuated (Cels. 3.18.17 footnote d, Vol. 1 p 298). Melancholia is modernly defined as a severe depression, usually psychotic (Martin 2002:360).

286 Sometimes "purge" means "bowel evacuation" and sometimes"emetic". Scarborough explains that when the ancient authors say that a drug "purges upward", it is seen as an emetic and if it "purges downwards", it is a laxative.

287 Elephantiasis is seen as a result of filiariasis and leprosy (Spencer 1953:342 footnote a).

Dioscorides writes that it purges the lower abdomen driving phlegm and bile downward when given in the amount of one *drachma* [288] or one *triobolon* [289] either by itself or with scammony and salt. But it was also boiled with lentils and with broths that were usually taken for purging (Diosc. 4.162.2).

But Celsus thinks that it is necessary to move the bowels by a purge of black hellebore (Cels. 3.23.3,4). Celsus writes that hepaticon[290] was also cured by hellebore since black hellebore stimulated bowel movement (Cels. 4.15.2), while white hellebore was a remedy for dysentery[291] and was employed to induce vomiting (Cels. 4.23.3), as part of the purging process.

Pliny reports that it was believed to purge the bowels[292] and when the white hellebore was mixed with sesamoïdes,[293] it was principally used as a purgative to cure melancholic madness, epilepsy and gouty pains.[294] Hellebore was also given in preference to mandrake[295] to purge away black bile and was used as an emetic (*H.N.* 25.150). Apparently, the white hellebore purges one by inducing vomiting, but the black one by stool (*H.N.* 25.51). Pliny writes that most scholars also took hellebore regularly to sharpen their brains for their studies (*H.N.* 25.51). Pliny explains that it draws bile, phlegm and morbid fluids from the belly (*H.N.* 25.54). Even when the hellebore proves successful, its effects could cause anxiety to the patient: the colour of the vomit would vary, and when the vomiting ceases, then comes the worry of watching the stools, of superintending the bath, of attention to the whole body, all these troubles being preceded by the great terror caused by the drug's reputation (*H.N.* 25.57).

Theophrastus recommends the use of the fruit for purging (*H.P.* 9.9.2).

---

288 3.411 g

289 1.794 g

290 Liver abscess, *hēpatikon pathos*, was distinguished by Aretaeus, *Chronic diseases* Book 1.13 and 1.15.

291 It seems strange that Celsus would administer a purge to a patient who suffered from an intense form of diarrhoea. The only explanation is that he thought that a purge would clean the intestines from whatever was causing the diarrhoea.

292 *"Asarum... alvum purgat ellebori modo"* (Plin. *H.N.* 21.134).
"Hazelwort... purges the bowels after the manner of hellebore".

293 According to Beck this is the Bastard rocket of Dioscorides 4.149, which people in Anticyra called "elleboros". This plant resembles the groundsel or the rue. It is taken with three obols of white hellebore and hydromel (2005:305).

294 "*Miscent ibi et ellebori albi unum et dimidium obolum, purgationem eam adhibentes maxime insaniae melancholicae, comitialibus, podagris*" (Plin. *H.N.* 22.133).

295 Perhaps because one did not want the patient to become drowsy.

Theophrastus says that the black variety of hellebore is fatal to horses, oxen and pigs. That is why none of these animals would eat it.[296] The fact that the plant has medicinal properties was first observed when sheep ate the white kind and was purged by it (*H.P.* 9.10.2). Farmers also purify horses and sheep with hellebore while chanting an incantation and they put it to several other uses (*H.P.* 9.10.4).

In order to make hellebore more effective as an emetic, Theophrastus mixed the seed of rupture-wort[297] with a hellebore potion (*H.P.* 9.10.3).

Not only the stomach was purged, but hellebore was also used as diuretic to purge and cleanse the kidneys. According to Theophrastus, the ancients say that hellebore from Elea [white hellebore] grows in the vineyards and causes the wine to be so diuretic that those who drink it become quite emaciated (*H.P.* 9.10.3).

7.5.8 OTHER USES

Celsus ascribed the properties of an erodent[298] (5.3.6) and a caustic (5.6.8) to hellebore. He also did not distinguish between white and black hellebore - according to him, both had the same effects.[299]

It was recommended for epileptics, the atrabilious,[300] the insane, arthritics, and paralytics. Dioscorides believed that, inserted as a suppository, it engenders the menstruals and is an abortifacient, it cleanses fistulas when put onto them and removed after the third day, and it is similarly inserted into the ear of the hard of hearing and left there for two or three days. It was also used to treat mange when smeared with frankincense, beeswax, and the watery part of wood tar or oil of cedar; and when daubed on, either with vinegar or by itself, it treats dull-white leprosies, lichen-like[301] eruptions on the skin, and leprosies. It was mixed with putrefactive medications, and with barley meal and wine it was regarded as a useful plaster for those suffering from edemata[302] (4.162.3).

---

296 This belief was probably part of the agricultural lore of the time.
297 *Herniaria glabra* L.
298 In the 19th century pharmacology, an erodent and caustic means a drug that eats [something] (extraneous growths) away (Martin 2002:239).
299 Cels. *De medicina*. List of Medicamenta Vol. 2 p lviii.
300 Brock (1916:208) writes that atrabiliary means "very melancholic, a hypochondriac or even when a person is irritable as if he is suffering from indigestion".
301 An extremely itchy skin disease of unknown cause (Martin 2002:392).
302 Edema.

Pliny regarded hellebore as an appropriate remedy for struma,[303] and it was used against shivering, choking and strangury, prolonged hiccoughing or sneezing (*H.N.* 25.56). Pliny recommends applying it as an emollient (*H.N.* 25.55).

When there is a miscarriage, a branch of hellebore smeared with galbanum and laid under the woman, will bring away the fetus.[304]

Pliny also refers to the fact that black hellebore kills horses, oxen and pigs; so they avoid it, although they eat the white kind (*H.N.* 25.48).

It is also used to relieve white leprosy, leprous sores, tetanus, palsy, dropsy and incipient tympanitis (Cels 3.21), stomachic affections, muscle contractions, sciatica, quartan fever that yields to no other treatment, chronic cough, flatulence and recurrent cramps (Plin. *H.N.* 25.60).

Pliny recommends hellebore applied externally with salted axle-grease to cure pituitous[305] eruptions on the body and also suppurations[306] of long standing. He says that phthiriasis[307] too is cured when pounded hellebore, mixed with milk is sprinkled on the patient (Plin. *H.N.* 25.61).

Pliny reports that hellebore draws bile from the belly as well as phlegm and morbid fluids. It also disperses films over the eyes and when pounded, it is used as eye salve (*H.N.* 25.54).

It clears up scrofulous[308] sores, suppurations and indurations, fistulas and it removes warts; it cures itch in quadrupeds as well as dropsy (*H.N.* 25.55). When white hellebore is mixed with the fat of especially pigs, it softens corns and callosities (Plin. *H.N.* 28.140), and sores that have been caused by soda[309] (Plin. *H.N.* 29.110).

---

303 Celsus describes struma as swelling of the lymphatic glands in the neck, axilla and groins, often tuberculous (scrofulous) in origin, leading to the formation of a cold abscess (Cels. 5.28.7A footnote a, book 2 p 140).

304 *"Abortus non exeuntes trahit adpositu vel suffitu, item ramo hellibori circumlitum atque subiectum"* (Plin. *H.N.* 24.21).
"A pessary or fumigation brings away the foetus when there is a miscarriage, and so will a branch of hellebore smeared with it and laid under the woman".

305 Pituitous often means "curd".

306 Suppurations are better known as "running boils" or "sores".

307 Phthiriasis is and all-encompassing term that usually means "wasting" disease. Phthisis is a term used for lung-diseases like tuberculosis or pneumonia.

308 Scrofula is a 19th century term which implies the swelling of lymph nodes in the upper throat or neck or even the submandibular nodes and the common oversized thyroid gland = "goiter" (Martin 2002:619).

309 Niter.

7.6 DOSAGE

Pliny accuses the ancient physicians of being too cautious in prescribing doses of white hellebore. According to him a larger dosage will be all the more effective (*H.N.* 25.57). For gently moving the bowels the maximum dose is one *drachma*; a moderate one is four *oboli* [310] (*H.N.* 25.54). Pliny says that Themison gave doses of not more than two *drachmae*;[311] his successors actually increased the amount to four [312] (*H.N.* 25.58).

When hellebore is taken in raisin wine or in honey wine, the dose is four *drachmae* (*H.N.* 26.40).

Celsus's dosage is much milder. He writes that if one dose of hellebore has little effect, another should be given after an interval (3.18.20).

7.7 TOXICITY

7.7.1 ANCIENT ANTIDOTE

Theophrastus gives a recipe for an effective antidote to hellebore:

"However this man (the Chian Eudemus)[313] was able to hold out[314] because he had provided himself with an antidote; for he said that after the seventh dose he took a draught of tart[315] vinegar with pumice-stone dust in it, and later on took a draught of the same in wine in like manner; and that the property / power of the pumice-stone dust is so great that, if one puts it into a boiling pot of wine,[316] it causes it to cease to boil, not merely for the moment, but altogether, clearly because it has a drying effect and it catches the vapour and passes it off".

---

310 2.272 g
311 6.822 g
312 13.644 g
313 Scarborough thinks that Eudemus of Chios probably *fl. ca.* 350 BC since Aristotle and Theophrastus etc. would not quote contemporary authors, but wouldl more probably refer to the sources of a previous generation.
314 Contain the diarrhoea.
315 Tart = sharp, pungent or acrid.
316 See Plin. *H.N.* 36.42; Plin. *H.N.*14.138

According to Theophrastus, this antidote enabled Eudemus to contain the diarrhoea in spite of the large quantity of hellebore which he took[317] (*H.P.* 9.17.2-3). Pliny records another antidote: when castoreum (beaver-oil)[318] is mixed with oxymel[319] and soda, it acts as an antidote for white hellebore.[320]

MODERN HELLEBORE

7.8 MORPHOLOGY

Grieve (1931:388) gives the following description of hellebore: "...it is a perennial, low-growing plant, with dark, shining, smooth leaves and flower-stalks rising directly from the root, its pure white blossoms appearing in the depth of winter". The rhizome is blackish, occurring as a tangled mass of short branches, bearing straight, slender, rather brittle black rootlets with a central cord (Williamson 2003:213).

The taste is bitter and acrid, with a faint and fatty odour (Williamson 2003:213).

7.9 DISTRIBUTION AND HARVESTING

It is a native of the mountainous regions of central and Southern Europe (Evans 2002:23), Greece and Asia Minor and many other places, from Spain through Iran (Grieve 1931:388). It is cultivated in Britain as an ornamental. The plant flowers in mid-winter, hence the synonym "Christmas Rose" (Williamson 2003:213). Uphof writes (1968:265) that the rhizome is collected during autumn and dried.

7.10 PROCESSING OF THE PLANT

Dried powdered root is used to induce sneezing (Duke 1985:227).

---

317 Eudemus' mixture of pumice, vinegar and wine to make an antidote, was most probably effective. Pumice is more or less the same as kaolin pectin that is used in modern pharmaceutics. It is used to stop diarrhoea. This can also be seen as the action of dry vs. wet as described by Galen (*Natural faculties* 1.3) who used to treat with opposites (see Chapter 1, p 4).

318 A material derived from the pre-putial follicles in the genitals of the beaver, *Castor fiber*. It had a pungent taste, suggesting musk, was used internally as a stimulant (Cels. 3.16.2; 3.20.4; 3.23.7; 4.6.3; 4.27.C, externally in eye and ear salves, Cels. 6.6.5D; 6.7.8D).

319 Oxymel consists of a mixture of vinegar and honey.

320 *"Castoreum...adversus helleborum album ex aqua mulsa nitroque"* (Plin. *H.N.* 32.31). "Beaver-oil...for white hellebore in oxymel and soda".

7.11 ADMINISTRATION

The dried powder causes violent sneezing when it is used as snuff. It is also used in tincture form and as a local application (Grieve 1931:389). Root, rootbark or seed is used for cancer or indurations (Duke 1985:227).

7.12 DOSAGE

In a fluid extract, 2 - 10 drops is used which is equal to 1 - 2 grains of the solid extract. When the powdered root is used as a drastic purge, the dosage is 10 - 20 grains but to induce sneezing, only 2 - 3 grains will suffice. The decoction is prepared by mixing 6.82 grams of hellebore to a pint of fluid and then a fluid ounce is administered every four hours until the required effect is attained (Grieve 1931:389).

7.13 PHYTOCHEMISTRY

The active principles in the hellebore generally consist of helleborine and other bufadienolides (Van Wyk *et al.* 2004:412), as well as helleborein (Uphof 1968:265). The aglycone hellebrigenin is the bufadienolide analogue of strophanthidin (Evans 2002:313).

7.14 PHARMOCOKINETICS

Helleborine and helleborein and hellebrin are crystalline glycosides. Helleborine has a burning acrid taste while helleborein has a sweetish taste (Grieve 1931:389). Helleborein and hellebrin have digitalis-like action and hellebrine is approximately twenty times more powerful that helleborein (Evans 2002:23).

7.15 PHARMACOLOGY

Black hellebore is used to treat hypertension (Van Wyk *et al.* 2004:353) and inflammation of the urinary tract. This is because it leads to increased urine formation and have a rinsing and anti-inflammatory effect in the urinary tract (Van Wyk *et al.* 2004:360). It is also used as an emetic, laxative and antihelmintic (Van Wyk *et al.* 2004:412; Grieve 1931:389). Helleborine is narcotic while helleborein is a highly active cardiac poison and a drastic purgative. It is also used in dropsy and amenorrhoea and has proved valuable relief in the treatment of nervous disorders (Grieve 1931:389).

7.16 TOXICITY

Celsus reported that some patients suffered from spasms after a draught of hellebore (Cels. 2.6.7) and this was quite possible since hellebore contains cardiac glycosides which cause inability of the heart muscle to supply adequate amounts of blood to the body. Oxygen-poor blood is due to the blockage of the coronary blood vessels (Van Wyk *et al.* 2004:351).

According to Sweetman (2002:1679), veratrum alkaloids may cause nausea and vomiting after the conventional doses have been administered. Other effects include epigastric and sub-sternal burning, sweating, mental confusion, arrhythmias, dizziness and hiccups.

According to Duke (1985:227), the actions of hellebore are internally violently narcotic. Grieve (1931:389) adds that hellebore is a highly active cardiac poison with similar effects to digitalis. When applied locally, the fresh root is extremely irritant. According to Steinmetz (Duke 1985:227), this herb is an acro-narcotic poison in large doses. There are many cases of human poisoning from confusion with other herbs, through consuming the seeds or through medicinal overdoses. Symptoms include dry or scratchy throat and mouth, salivation, nausea, stomach ache, vomiting, colic, diarrhoea, irregular slow pulse, weak heartbeat, dyspnea, vertigo, ringing ears, mydriasis, disturbed vision, and excitement in fatal doses, coronary arrest and collapse, i.e. death.

7.16.1 MODERN ANTIDOTE

Emesis or gastric lavages, warm towels and spasmolytics to relieve the colic and treatment with digitalis are recommended (Duke 1985:227).

7.17 CONCLUSION

The black and white hellebore have nothing in common except the **name**. The fact that they are called "white" and "black" is probably due to the white blossoms the one species bears in winter while the other species is called "black" because of the dark-coloured rootstock (See names at the beginning of this chapter, p 120).

In modern pharmacy the white hellebore (*veratrum*) is the one that is mainly used as **hypotensive and insecticide** which proves that it is a multipurposed drug, and not only used as a narcotic and purge.

The correspondence of the **morphological descriptions** found in both ancient (§7.1) and modern sources (§7.8), confirms that the plant used in modern pharmacy is the exact same one that was used by the ancients. Both the ancient and modern description mention the dark smooth leaves with flowers growing directly from the root. The flowers are white and the blossoms appear mainly in winter. The geographic distribution also corresponds, and hellebore is still native to Southern and Eastern Europe today (§7.9). Thus, according to the distribution and morphology, it is possible to identify the plant positively.

According to modern pharmaceutical texts, the root, root bark, rhizome and seeds are **mainly used** (§7.11), which corresponds to the plant parts mentioned in the ancient texts. The ancients actually also made use of the fruit and juice of the fruit and the whole plant as well (§7.2.1).

Folklore attached superstitious beliefs to hellebore in ancient times: it could only be **administered** on a sunny day, for on a cloudy day the purging process would be unbearable (§7.4.1). It was therefore only administered in summer, and not in winter. Superstitious beliefs prohibited certain people from using hellebore (§7.4.1). The plant was only collected after praying for permission to Apollo and Aesculapius, facing to the east and the presence of an eagle was regarded as a bad omen (§7.2.2).

Hellebore did not only have **medicinal effects**, but it was also used as fumigation and insecticide, and even as meat tenderiser. The most common use for hellebore was "downward purging", i.e. as a laxative (§7.4.1).

In ancient times hellebore was **administered** mainly mixed with wine (§7.4), while snuffing the powdered hellebore relieved lethargy (§7.5.4). The wine mixture was taken not only to purge, but to provide relief from epilepsy (§7.5.5) and to cure psychological diseases (§7.5.6). Phytochemistry confirms that hellebore has a narcotic effect due to the helleborin content in the plant (§7.15). It has no properties that would prove effective in the treatment of epilepsy nor will it solve pshycological problems, but it would calm the patient down and induce relaxation (§7.15). The

ancients' claim that it also relieved **arthritis, gout** (§7.5.2) and **toothache** (§7.5.3) is valid due to the **narcotic effect** of helleborin (§7.15). Scarborough classifies hellebore as a soporific plant (2009:1), but the ancient and modern texts make it clear that hellebore was and is still mainly used as a purge, even though the helleborin exerts narcotic properties on the human body. Helleborein has drastic **purging** properties (§7.15), which explains why hellebore was successfully used as a purgative (§7.15).

Hellebore contains **cardiac glycosides** which cause inability of the heart muscle to supply enough oxygen to the body (§7.16). This would explain why hellebore could be effective as an abortifacient. One problem is that it not only killed the fetus, but likely the mother as well (§7.5.8).

Dermatological problems (§7.5.8) like pituitous eruptions on the body and also suppurations of long standing, dull-white leprosies, lichen-like eruptions on the skin, leprosies, mange, the cleaning of fistulas and incipient tympanitis could perhaps have been successfully treated with hellebore because of the purging effect of the helleborein (§7.15). This would also be true of phthiriasis, phlegm and "morbid" fluids which are also expelled.

Explanations for the eroding effect, engendering of the menstruals, edemata struma, shivering, choking and strangury, prolonged hiccoughing or sneezing are other ancient indications (§7.5.8) which cannot be explained in terms of phytochemistry and would thus not be seen as valid indications. Tetanus, palsy, dropsy and stomachic affections, muscle contractions, sciatica, quartan fever that yields to no other treatment and chronic cough, flatulence and recurrent cramps can also not be explained, and the use of hellebore as an eye salve (§7.5.8) was probably not successful.

Some of the ancient and modern uses of hellebore do **overlap**. The helleborin alkaloid exerts a narcotic effect, and the helleborein has a purging effect on the body, and it is therefore certain that hellebore can be used successfully for both these purposes.

The interesting problem (or wonder!) is that while modern researchers have to explain these effects according to phytochemical experiments, the ancients obtained this knowledge purely from their empirical observations.

CHAPTER 8
WITHANIA SOMNIFERUM L.

English – Sleepy nightshade, Winter cherry

Afrikaans – Geneesblaarbossie, Meidjieblaar, Vuilsiektebos

Zulu – Ubuvimbha, Umuvimba

Xhosa – Ubuvuma

Sotho – Bofepha, Moferangopa, Moferangope, Mosalasopeng, Mosalamarupi

Indian (Hindi) - Ashwagandha

French - Withania

German - Schlafbeere, Withania

Italian - Ginseng indiano

In English, withania is commonly known as "sleepy nightshade". In ancient times it was sometimes called *halicaccabon* or *caccalia*, as Dioscorides reports (4.72). According to Pliny, sleepy nightshade was also known as "morion" and "moly".[321] It was also referred to as "*abellanarum nucum*", the white-rooted mandragora (*H.N.* 25.148).

Withania somniferum got its Indian name Ashwagandha from the Sanskrit word "*ashva*" (meaning horse) and "*gandha*" (meaning smell) because of the odour of the root (Heinrich 2004:278).

This plant is the best known for its use in Ayurvedic medicine[322] where the Ashwaganda is used as a sedative, hypnotic and adaptogenic because of its property to relieve stress. It is also known as "Indian ginseng" because of its use in Hindi medicine as a general tonic. Some Ayurvedic physicians use ashwaganda

---

321 "*Quin et alterum genus quod halicacabon vocant soporiferum est atque etiam opio velocius ad mortem, ab aliis morion, ab aliis moly appellatum*" (Plin. *H.N.* 21.180).

322 Ayurveda, an Indian word, means "the science of life" (Sofowora 1982:13).

interchangeably with the real ginseng plant (*Panax ginseng*) since the roots are similar and the medicinal effects are the same (Van Wyk *et al.* 2004:346).

According to Pliny this is a plant that was praised by Diocles and Evenor, by Timaristus indeed even in verse, without a thought of its possible harmful effects.[323] Theophrastus classed both sleepy nightshade and deadly nightshade under *strykhnoios,* distinguishing between sleepy nightshade which induces sleep, and deadly nightshade which causes madness[324] and even death.[325]

8.1 MORPHOLOGY

Dioscorides describes it as a shrub with many thick, trunk-like branches, which are hard to break. It bears fatty leaves which resemble the leaves of quince, the sizeable coloured flowers are red in color, its saffron-coloured fruits are contained in pods and it has a root of good size which is covered by a reddish peel. It grows in stony places (4.72.1). Theophrastus adds that the root becomes red like blood as it dries, but when first dug up it is white and according to Theophrastus the colour of the fruit is a deeper orange than saffron and the stem of the plant is rough and about a foot high.[326]

8.2 DISTRIBUTION

Theophrastus writes that sleepy nightshade grows in water-courses and on tombs,[327] while the nightshade with the scarlet fruit grows in the country of the Arcadians (*H.P.* 9.15.5).

8.3 HARVESTING

No harvesting method was reported by the ancients

323 Plin. *H.N.* 21.180
324 Theop. *H.P.* 9.11.5
325 Theop. *H.P.* 7.15.4
326 Theop. *H.P.* 9.11.5
327 Theop. *H.P.* 9.11.5

8.4 PROCESSING AND ADMINISTRATION

Theophrastus also gives the best description of the process by which the medicinal properties were made available: the bark of the root was bruised severely and soaked in neat wine, so that it could be taken as a draught. [328] A paste of the leaves was also applied, and ointments were made by adding fat or oil.[329]

8.5 EFFECTS

8.5.1 SLEEP AND PAIN

Dioscorides describes the soporific and analgesic properties as follows: "An amount of one *drachma* of its root's peel drunk in wine has a soporific property that is milder than that of the juice of opium poppy, and its fruit is very diuretic. About twelve clusters are given to those with edemata, but if they should drink more, they cause them severe mental distress. Drinking large quantities of hydromel helps them. Its peel is mixed also with analgesics and lozenges and it helps for toothaches when boiled down in wine and held in the mouth. The juice of the root, anointed with honey, allays dim-sightedness" (4.72.2).

Pliny distinguishes between the nightshades and mandrake and he ascribes the following effects to the sleepy nightshade:

"Quin et alterumalterum genus quod halicacabon vocant soporiferum est atque etiam opio velocius ad mortem...Exceptionem addidere, ne diutius id fieret; delirationem enim gigni" (*H.N.* 22.180).

"There is besides another kind, with the name of *halicacabos*, which is soporific, and kills quicker even than opium...They added a proviso, that the rinsing must not go on too long, for delirium is caused thereby".

8.5.2 OTHER EFFECTS

Pliny informs us of some other properties ascribed to *W. somniferum*. He writes that when the mouth is rinsed with a mixture of wine and *halicacabos*, it strengthens loose

---

328 Theop. *H.P.* 9.11.5
329 Theop. *H.P.* 9.11.5

teeth. He confirms that it can cause madness, but pounded and mixed with wine it is placed on snakebite as a healing antidote.[330] The hallucinogenic effect is stressed by the ancient authors and was the plant's most prominent characteristic (*H.N.* 21.180).

8.6 DOSAGE

According to Theophrastus the amount of root used in a decoction is as follows: " Of this (cubit long hollow root) three twentieths of an ounce[331] in weight is given, if the patient is to become merely sportive and to think himself a fine fellow; twice this dose[332] if he is to go mad outright and have delusions; thrice the dose[333] if he is to be permanently insane; (and then they say that the juice of centaury is mixed with it); four times the dose[334] is given, if the man is to be killed".[335] We already know that hemlock was used to exact capital punishment, perhaps withania was also used for this purpose.

8.7 RECIPES

Prominent recipes from the Graeco-Roman times seem not to include Withania, so therefore it can be concluded that *W. somniferum* was used exclusively as a simple drug to induce sleep or relieve pain.

8.8 ANCIENT ANTIDOTES

Pliny supplies us with one of few antidotes to Withania:

"*Id enim libentius rettulerim- aqua copiosa mulsa calida potu*" (*H.N.* 21.180).

"The remedy for it, which I am happier to mention, is a copious draught of hot hydromel".

---

330 Plin. *H.N.* 21.180
331 Approximately 0,05 gram
332 Approximately 0,1 gram
333 Approximately 0,15 gram
334 Approximately 0,2 gram
335 Theop. *H.P.* 9.11.5

Evans (2002:585) writes that there is only one species found, *W. coagulens* L. The following are synonyms for *W.somniferum*; *Physalis somniferum* L. and *Withania microphysalis* Suess. (Arnold 2002:131). Withania is an indigenous plant of Southern Africa and it is widely distributed, not only through South Africa, but the world (Germishuizen *et al.* 2003:918).

8.9 MORPHOLOGY

Van Wyk *et al.* (1997:274) describe the plant as "an erect perennial shrublet with densely velvety stems and pale-green leaves". It grows up to 2 m high with hairy multibranched stems. The leaves are about 10 cm long with entire or wavy margins (Iwu 1993:259) and it has an elliptical form with an acute apex (Heinrich 2004:278). It has small flowers of about 1 cm long (Iwu 1993:259). The colour of the flowers vary, however, and are described as either white or yellowish with orange-red berries. According to van Wyk and Wink, the berries are "enclosed in brown bladdery structures that are formed by the remains of the sepals, which enlarge as the fruit develop" (Van Wyk *et al.* 2004:346).

8.10 DISTRIBUTION

In the modern world *W. somniferum* is widely distributed in Africa, South-eastern Europe and Asia. It is regarded either as a weed or as a medicinal crop plant (Van Wyk *et al.* 2004:346). Iwu (1993:259) reports that it grows in drier tropical regions as well as in stony and semi-arid regions, although it is cultivated widely (Heinrich 2004:278).

8.11 ADMINISTRATION OF THE PLANT

In modern pharmaceutics withania is still dispensed in the form of decoctions, infusions or tinctures prepared from the whole plant (Van Wyk *et al.* 1997:274). The leaves or roots (or even the whole plant) may be applied to wounds while ointments are made with the addition of fat or oil (Van Wyk *et al.* 2004:346). In West African folk medicine it is consumed (Iwu 1993:259), and in Sudan they use the seed to coagulate milk (Uphof 1968:553).

The leaves are steeped in warm castor oil[336] and applied locally to carbuncles and swellings (Duke 1985:514). In folk medicine, healers use freshly pounded leaves internally (taken orally or inserted rectally) as well as externally to relieve fever, chills and rheumatism (Iwu 1993:259).

Bruised berries are rubbed onto ringworm (Duke 1985:514).

The bark infusion is taken for asthma and applied topically to bedsores (Duke 1985:514).

The dried roots are considered useful in treating consumption (Lewis 1977:308).

8.12 PHYTOCHEMISTRY

Withanolides A - Y (Heinrich 2004:278) in addition to producing alkaloids also contains steroidal lactones (Evans 2001:82). Withanasomnine is one of the alkaloids present in the plant (Van Wyk *et al.* 1997:274) but isopelletierine and anaferine are also found (Mishra *et al.* 2000:336). Numerous steroidal lactones with an ergostane skeleton are found, called withanolides (Van Wyk *et al.* 1997:274) of which withaferin A (Van Wyk *et al.* 2004:346) and withanolide D (Hoffmann 2003:84) are well known. Saponins containing an additional acyl group (sitoindoside VII and VIII), and withanolides with a glucose at carbon 27 (sitoindoside IX [withaferin A-C27-O-β-D-glucoside] and sitoindoside X [6'-O-palmitoyl-withaferin-A-C27-O-β-D-glucoside]) (Iwu 1993:260). *W. somniferum* is also rich in iron[337] (Mishra *et al.* 2000:336). Other active principles found are withanasomniferols A - C, as well as the alkaloids anahygrine, cuscohygrine, ashwagandhine, ashwagandhinine, withanine and somniferine (Heinrich 2004:278).

8.13 PHARMACOKINETICS

Withaferin A = $C_{28}H_{38}O_6$ has a molecular weight of 470.60. The concentration of the carbon chain is as follows: C = 71.46%, H = 8.14% and O = 20.40%. White prisms form when it is mixed with acetone-petroleum ether. Withaferin has a melting point of between 252 - 253°C (Budevari 2001:1792).

---

336 From the plant *Ricinis Communis* L.
337 Ferrous sulphate.

8.14 PHARMACOLOGY

The activity of withanolides and other compounds have been ascribed to antibiotical and anti-inflammatory effects. It is mainly due to the withaferin A content (which is approximately 0.2% of the dry weight (Evans 2001:82). Sedative and hypnotic effects have been ascribed to the tropane alkaloid content (Lewis 1977:15), but there are doubts about the narcotic properties. It has been employed as a hypnotic in cases of emphysema, alcoholism and pulmonary tuberculosis (Iwu 1993:260). The extract is also reported to be anxiolytic, possibly due to GABA-mimetic activity (Williamson 2003:32).

According to the research done by Mishra *et al.* (2000:342) on ashwagandholine, total alkaloids extracted from the extract of the roots off *W. somniferum*, had relaxant and antispasmodic effects against various agents that produce smooth muscle contractions. The pattern of smooth muscle activity was similar to that of papaverine, but several-fold weaker, suggesting a direct musculotropic action.

8.14.1 OTHER USES

Ashwagandha has been used in Ayurvedic medicine for about 4000 years, as a tonic in debility and for emaciation (Williamson 2003:32). It is used to enhance fertility in both men and women and as an aphrodisiac (Williamson 2003:32).

Recent studies showed that sleepy nightshade possesses anti-inflammatory (Beckwith 1998:109), anti-stress, antioxidant, immunomodulatory, hemopoietic, and rejuvenating properties (Mishra *et al.* 2000:336). It also exerts a positive influence on the endocrine, cardiopulmonary, and the central nervous systems (Mishra *et al.* 2000:335).

Kuroyanagi *et al.* (1999:1646) write that in addition to their pharmacological value, some withanolides are cell differentiation inducers, which implies that the withanolides are now a compound of a new type of anti-tumor agent.

It is also, like real ginseng (*Panax ginseng*), an ingredient in general tonics to increase energy and to improve health and longevity. This is an important ingredient in Hindi formulations for an energy booster (Van Wyk *et al.* 2004:346). Withania is used in Indian Ayurvedic medicine to attenuate cerebral function, especially amongst geriatrics. It is also used to improve memory and to facilitate learning (Iwu 1993:269).

Iwu (1993:260) writes that the withanolides have different effects on the immune system because withaferin A produce suppression of adjuvant-induced arthritis. It is also widely used in inflammation, colds, asthma. This immunosuppressant action is also ascribed to other structurally related withanolides. This adaptogenic agent possesses components with both stimulatory and depressant action on immunity (Williamson 2003:32).

It is also used in formulations prescribed for musculoskeletal diseases (arthritis and chronic rheumatism) (Mishra *et al.* 2000:334). *W. somniferum* can also be seen as an adaptogenic, which means that it constitutes the core of herbal support for conditions affecting the adrenal medulla. It provides general systemic support to help ease the impact of tension and anxiety (Hoffmann 2003:465).

It is, according to Duke (1985:514), reported to be abortifacient, an anodyne, contraceptive, diuretic (Lewis 1977:313), emmenagogue, narcotic, poison, sedative, spasmolytic and a tonic. Lewis adds that the leaves are active against a broad spectrum of bacteria and viruses, acting as an amebicide, bactericide, fungicide and pediculicide (Lewis 1977:364). The withanolides also are antihypertensive agents (Iwu 1993:260), and produce an anti-hepatotoxic effect, and as an astringent, the leaf acts as a febrifuge (Evans 2001:418).

8.15 ADVERSE EFFECTS

No adverse effects (Heinrich 2004:279).

8.16 TOXICITY

It is categorized as a narcotic, sedative and tranquilliser and is a known poison (Duke 1985:515). The berry is sometimes eaten by children, and will cause severe gastrointestinal upset (Duke 1985:515). In Sri Lanka it was found that marked renal lesions form with chronic consumption of *W. somniferum* (Iwu 1993:260).

8.17 CONCLUSION

Withania belongs to the Nightshade family and is still a very popular drug in Ayurvedic medicine. Withania's Latin name, *somniferum*, which, loosely translated, means "bringer of sleep" indicates that its soporific effect was well known in the ancient world.

The ancient and modern **morphological description** of the plant correlates, except the flowers. The ancients described it as red (§8.1), while modern botanists admit that the colour varies but mainly between white and yellow. Although the description of the flowers and the colour of the fruit given by Theophrastus and Dioscorides (§8.1) differ from that of Van Wyk and Wink (§8.9), there is no doubt that the plant which the ancients called sleepy nightshade and which today is known as *Withania somniferum*, is one and the same plant.

The ancients bruised the bark severely and soaked this bruised bark in wine, for drinking it afterwards as a decoction (§8.4). They applied a paste of the leaves and they made an ointment by adding an oil base. The fruit peel was applied to the teeth to relieve toothache and the juice of the root was mixed with honey. In modern pharmacy decoctions, infusions and tinctures are available (§8.11). In modern medicine, they also use leaves to apply to wounds and carbuncles. Freshly pounded leaves are either applied externally or drunk for internal effects. The ointment is also still in use. Modern healers also bruise berries and they powder dried root. Withania is widely cultivated and is a cosmopolitan herb, found in Europe, and also in South Africa (§8.10) where it is still used in traditional medicine. The ancients and modern herbologists use mainly the same plant parts: leaves, berry-peels and fruit juice. The ancients also used the bark (§8.4), while modern herbologists show a preference for the root (§8.11).

The ancient physicians used Withania mainly as an **anodyne and analgesic** (§8.5.1). *W. somniferum* has the same effect on the pattern of smooth muscle activity as papaverine, (*P. somniferum*), which is a strong analgesic. With smooth muscle relaxation, deeper breathing is obtained, which leads to total relaxation of the body (§8.14).

It is indeed contradictive while it has energising effects (§8.14.1) to ascribe soporific properties to this plant but the alkaloid content plays an enormous role in the analgesic and soporific effect (§8.14.1).

Herbalists use Withania in modern times not only as sedative and hypnotic, but also as remedy of adjuvant-induced arthritis due to the immune-suppressing effect of withaferin A. New research shows that Withania exerts anti-tumor effects because of the cell differentiation inducing withanolides (§8.14).

Pliny writes that hellebore strengthens loose teeth (§8.5.2). In modern science it is known that withanolides exerts anti-biotical and anti-inflammatory effects. One can assume that when the pain and infection is cleared, the teeth would feel stronger and more stable. The anti-inflammatory effect would also be the reason why it could be used for snakebites although it would rather relieve inflammation than act as a proper antidote (§8.14.1).

This is one of the plants that was not only very popular in ancient Rome, but is still used both in in Ayurvedic medicine and by South African traditional healers.

CHAPTER 9

SOUTH AFRICAN AND TRADITIONAL HEALING

9.1 INTRODUCTION

Throughout the ages, men have relied on nature for their basic needs of survival. This includes not only sources of water, but also animals and plants. Plants have formed the basis of traditional medicine systems through several centuries and continue to be a source of new remedies. The vast majority of people in this world still rely on their traditional plants and other materials for their everyday medical needs. This is why it is necessary to search for differences and similarities among cultural conceptions of illness and healing. The terms ethnobotany and ethno-pharmacology means interdisciplinary fields of research concentrating on the empirical knowledge of indigenous peoples concerning medicinal substances, their potential health benefits and the health risks associated with such remedies (Gurib-Fakim 2006:10). Not only must the search be done between ancient cultures and the western world, but also between cultures in the same country. In different cultures, plants are not only seen as a source of healing, but plants have provided humankind with all its needs in terms of shelter, clothing, food, flavours and fragrances.

Herbal medicine is a great aspect (if not the biggest) of indigenous medicine. It is also an important aspect of everyday life for many people. Plants were the primary source of all medicine in ancient times and still are in rural areas where people are not introduced to western, chemical medication. According to Van Wyk *et al.* (2002:08), extracts of plants are sold in the informal and commercial sectors of the economy because several of today's medicines still are derived from plants (e.g. opium, morphine and codeine from *P. somniferum*, atropine from *D. stramonium* and hyoscyamine from *H. niger*).

This is also the folk medicine that will be discussed and compared with those of the ancients. Each system has its unique medicinal herb that cures a specific disease

effectively. It is actually noticed that a herb that is used in one system for a specific symptom is often used in another system for a total different symptom (e.g., hyoscine was mainly used in ancient times as a narcotic (see chapter 4) but in modern pharmacy, it is effectively used for stomach cramps). This shows the unique use (whether a person is superstitious or not) of medication and one realises that the knowledge of these plants can be seen not only as a science but also as an art. Each culture has its own system to preventand cure, and even to promote a healthy life. Since modern researchers have a better understanding of the physiology of the body functions, we are in a better position to understand why the healing powers of certain drugs are used for complicated health conditions.

9.2 TRADITIONAL HEALERS

Gurib-Fakim (2006:8) writes that Africa can be considered as the "cradle of Mankind with a rich biological and cultural diversity and marked regional difference in healing practices". Despite the seemingly exotic nature of the practice, the traditional healers have different strategies among Xhosa, Sotho and Zulu healers. Traditional healers are commonly known in South Africa as "inyanga, isangoma" and "ixwele" in Zulu, "amaquira" in Xhosa, "ngaka" in Sotho and "bossiedokter" or "kruiedokter" by the Coloured people in the Cape Province (Van Wyk *et al.* 2002:10).

The study of these traditional healers with their different traditions provides an insight into how these traditions developed and gives researchers the ability to develop modern medication on the basis of ancient uses.

According to the World Health Organisation (WHO), traditional medicine is defined as "health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral-based medicines, spiritual therapies, manual techniques and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses or maintain well-being (WHO 2003:134).

According to Hewson (1998:1030), traditional healers specialise in the spiritual, psychological, physiological and social contexts of illness and use natural medicinal preparations which seem to be effective in certain circumstances. To augment the diagnostic process, traditional healers also use drums or dances or even follow specific rituals such as washing themselves with purifying herbal drugs. These methods are based on social, cultural and religious backgrounds as well as on the

knowledge, attitudes and beliefs that are prevalent in the community regarding physical, mental and social well-being and the causes of disease and disability (Sofowora 1982:1). Traditional healers then determine the nature of problems by examining the symptoms and by asking questions about signs and symptoms. This helps the traditional healer to reveal the illness in the context of the patient's emotional state of mind as well as in context with his private and social life and physical environment. Traditional healers also use divining bones as diagnostic tools, as well as shells, dominoes and even the hoof of an animal. These diagnostic tools are usually thrown on a woven grass mat or on a dried animal skin. According to the traditional healers, they believe that "the bones speak to me and that the ancestors are speaking through the bones (to me)" (Hewson 1998:1032). Traditional healers seem to be concerned mainly with relieving suffering, controlling symptoms and restoring the physical, physiological and social function of the patient. Traditional healers also include herbalists, bone setters, village midwifes, traditional psychiatrists and spiritual healers (Sofowora 1982:20). Iwu adds (1993:03) that African medicine is concerned with power: the utilisation of human energy, the environment, and the cosmic balance of natural forces as tools in healing.

The traditional healer would also not only be contacted in times of sickness, but also when an evil omen is noticed. The Swazi believe that both disease and misfortune is a result of ancestral anger or the enormous evil powers of witches (Sofowora 1982:28).

For South African traditional healers, healing rests on the assumptions that if the mind is healed, the body takes care of itself (Van Wyk *et al.* 2002:08). According to Iwu (1993:01), it is a general belief that "every disease to which men are liable is occasioned by the substances whereon they feed". However, modern or western allopathic medicine has its root in the ancient traditions of healing and some of these aspects are still relevant and of use today in modern healing. There is however, no clear distinction that can be made in traditional African medicine as to when a herb is seen as non-food and when it is seen as medicine (Iwu 1993:01).

9.3 TRANSMISSION OF KNOWLEDGE

Indigenous medicine is usually unwritten and transmitted orally until someone takes the initiative to write a pharmacopoeia or a book of folklore medicine. Wisdom has also been passed on from one generation to the following through songs and poems, which scholars and physicians had to learn by heart and recite. (Gurib-Fakim 2006:11) A very popular way of transmission was also personal experience. Other types of transmission of knowledge include the society and community, family or a tutor or mentor (Hewson 1998:1032). Knowledge passed on by word of mouth was/is still a popular way of passing information on from one generation to another. Trial and error stays the very first way of gathering knowledge, with several cases of more suffering and even death before certain cures are discovered. Even if it is not systematised yet, the medical systems of the Khoi-San and Nguni are known but not written down. Since the Zulu as well as the Tswana and Southern Sotho did it, the information is easily obtainable.

9.4 DIFFERENT ASPECTS INFLUENCE DIFFERENT PLANTS

To do a relevant study it is necessary to compare the different aspects that came to the fore during the course of this research. This is to determine how traditional healing evolved through the ages, which level of knowledge they had and how that knowledge could be used to manufacture specific drugs today. It is also necessary to determine what role modern technology played in terms of the cultivation, gathering and processing of the plant, as well as the dosage forms, the different types of administration, the effects, side-effects and toxicity.

It is for obvious reasons that exactly the same plants cannot be used in South Africa as those used in ancient Rome and Greece. There are several reasons why not exactly the same plant is found, but the family[338] indeed, which still has the same biological compounds, active ingredients and thus induces the same effects.

---

338 Genera that share a common ancestor (Starr *et al.* 1995:8)

Reasons:

1. Different hemispheres: The northern hemisphere has extremely cold winters with a winter rainfall while the southern hemisphere has summer rainfall. The hemispheres also have different wavelengths of light, which have an influence on the type of plant (Starr *et al.* 1995:539). The type of soil in the hemispheres differ as well as the pH, the availability of water, level of water absorption and the drainage. The incidence of rays differ as well as the height below sea level.
2. The plants have biological clocks, which means that they also function in seasonal adjustments to the plant's patterns of growth, development and reproduction (Starr *et al.* 1995:538).
3. Different parts of the world have different temperatures as well as day length that change through the seasons that influence plant responses, including flowering (Starr *et al.* 1995:540).

9.4.1 DIFFERENT TIMING TO COLLECT THE PLANT MATERIAL

Timing plays a large role in the collection of plants. When one looks at the ancients, they also believed in a certain time and way how the plants had to be gathered. In chapter 2, the mandragora had to be collected, facing the west, without any trace of wind. The wind would be an indicator of death of the one who cut the plant. The same applies to black hellebore (see chapter hellebore). The cutter's timing must be perfect without any trace of an eagle (which also indicates death).

Just as the ancients believed in a certain time, so do the traditional healers. They believed that night collection of certain plants was necessary and characteristic in cases of witchcraft, in order not to disturb the supernatural beings. If that same plant would be collected in daylight, it would have a different use (Sofowora 1982:67). Like the ancients, certain rituals had to be observed before cutting / plucking the plant. In the chapter on mandrake, it was mentioned that a Roman had to use a sword drawing a circle around the plant. At the cutting of the second piece, the cutter had to dance and utter words on the mysteries of love. To obtain hellebore, a cutter had to pray and ask the gods permission to cut the plant and he had to drink a decoction of garlic and wine to protect himself (see chapter on hellebore). Incantation is a very important aspect during the collection process done by the traditional healers.

Incantation apparently enhances the efficacy of the plant when it is collected by night (Sofowora 1982:67).

The role of the ancient rootcutters corresponds to those of the professional herb gatherers. Their main purpose is to collect the plant samples and store the samples in accordance with certain traditions (Van Wyk *et al.* 1997:14). This could be a reason why the ancients wrongly referred to "black" and "white" mandragora. Because the rootcutters gathered it wrongly and presented it to the ancient herbologists as "black" and "white" mandragora.

Van Wyk *et al.* (1997:14) reports that experienced "inyanga" will seek motivation and guidance of a spirit of the ancestors before he goes on a plant-collecting trip. Guidance would take place through dreams or during prayers about which plant to collect for a specific cure.

9.5 METHODS OF ADMINISTRATION AND DOSAGE FORMS

Van Wyk *et al.* (2002:16) writes "The method of preparation is critical as it includes the amounts of fresh or dry plant material to be used, the addition of appropriate volumes of solvents such as water or alcohol, and additional activities such as boiling for a specific length or time, or partial burning to achieve a desired colour. These activities can serve to neutralize certain toxins".

9.5.1 METHODS OF ADMINISTRATION

It is important to know all the types of administration since this is the most important part of healing. The probability with which active ingredients enter the bloodstream of cells depends on the route of administration, polarity, stability and the chemical characteristics of the plant. Drugs that pass the liver are better metabolised than sublingual drugs or volatile compounds (Van Wyk *et al.* 2003:20).

The ancients used oral and topical administration methods (§2.4, 3.4), but also plasters, eardrops (§4.3) and inhalations (§3.4).

In modern medicine, oral and topical administration is still the most common. Parenteral administration is also common, even though the patient need someone to inject him. Medicine inhalations are also used to reduce the symptoms of asthma.

In traditional healing methods, some correlate with the ancients and even the modern types of administration. However, some differ a lot.

1. Bathing – herbal mixtures can be added to bath water to relieve certain conditions such as rush or just to maintain good health (Van Wyk *et al.* 2002:18). According to Sofowora (1982:36), hydrotherapy can be applied with either hot or cold water.
2. Bloodletting (cupping) - it is a common method in African medicine to rub extracts or powders of the herbs into small cuts made in the skin (Zulu: "umgaba"). The incisions can be deep on the affected part of the body (e.g. the knee in case of rheumatism or the back for backache). The impure blood is then sucked out with the aid of a horn open at both ends (Sofowora 1082:38). There is also a reference to bloodletting in the ancient text of Celsus, where he advises to do bloodletting in the case of erysipelas (Cels.5.33A).
3. Nasally – plants are taken dried or powdered as snuffs to induce sneezing which may traditionally be believed to aid the expulsion of disease. According to Van Wyk *et al.* (2002:18) the nasal route is an extremely effective method of introducing soluble phytochemicals directly into the cerebral circulation (Van Wyk *et al.* 2002:18).
4. Orally – infusions, decoctions, syrups or tinctures are taken by mouth. Powdered, dry herbs, partially burned herbs, or the ash of burned herbs are taken by mouth, followed by water. Among the Zulus it is common to drink a large volume of a weak, luke-warm herbal infusion, and then to self-induce vomiting to cleanse and tone the system ("ukuphalaza" or "ukughabha"). They often use sea-water as well (Van Wyk *et al.* 2002:18).
5. Rectally – infusions and some decoctions are administered as enemas, using tubes or syringes. In the African culture, a lubricated, truncated cow's horn is used to administer an enema. The medicine is rapidly absorbed through the delicate mucosa of the rectum and large bowel (Van Wyk *et al.* 2002:18).
6. Sublingually – some herbal remedies are administered by putting the herbal remedy under the tongue. The mucous membrane is richly supplied with blood vessels, which enhance blood flow. This ensure rapid

absorption of the medicine. The acidic action of the stomach as well as liver metabolism is avoided (Van Wyk *et al.* 2002:18).

7. Smoking – Certain plants are made into cigarettes and the smoke is inhaled. Sometimes the plant material is burnt in a potsherd and then the patient has to lean over the potsherd and cover his head by a blanket to inhale the optimum smoke (Van Wyk *et al.* 2002:18).
8. Steaming – some plants are inhaled by steaming it over hot water. A blanket is thrown over the patient's head and container. Hot rocks may be added to the mixture to make it boil. Herbal steaming introduce volatile phytochemicals and essential oils to the lungs to relievie asthmatic complaints (Van Wyk *et al.* 2002:18). Sofowora adds (1982:37) that it is important to inhale the vapour of the drug through the nose and exhale through the mouth.
9. Topically – medicine is applied directly to the skin, where the active ingredients can be absorbed into the tissues. Specific infusions, decoctions, tinctures, lotions, poultices or ointments can be used topically (Van Wyk *et al.* 2002:18).

9.5.2 DOSAGES

One of the major criticisms of traditional medicine is the fact that there are no standardised doses. This is because of the absence of complete didactic or pedagogic documents suitable to the different levels of training. All the problems pertaining to the available drugs from plants prepared in the traditional way have been analysed and research already carried out but there are still lots of aspects of certain plants that are not discovered. It is possible that traditional healers would use a certain plant for a specific indication but after chemical analysis, one would realise that it is actually an effective remedy for another indication.

In contrast, the ancients had specific dosages and weights and they prescribed the medication according to the dosage. The recipes were also according to amounts (see chapters), every ingredient according to its mass or volume.

Back to the traditional healing system, the standardisation of dosages is a great problem. According to Sofowora (1982:54), it is a well-known fact that the TH do not

use one teaspoonful or a tablespoon but rather a mouthful or one small tumbler three times a day. Even though the healer gives directions, it is very vague, because three times a day can also mean three times, one hour apart from the previous dosage.

9.6 DOCTOR VERSUS ANCIENT PHYSICIAN VERSUS THE TRADITIONAL HEALERS

Students who enroll for the MBChB course at any university, get academical education for five years, after which they must do three practical years. Intense study is thus the main objective.

Hippocrates (460 BC) was the first Greek to regard medicine as a science and now he is referred to as the father of medicine. He was a physician who travelled into foreign countries to do his own research on medicinal plants. Theophrastus (370 BC) was another famous Greek doctor, but also a biologist-botanist. He was practised medicine and wrote his standard botanical textbook *Historiae Plantarum*, one of the texts I also used. Dioscorides' (AD 60) *De Materia Medica* was regarded as the standard reference work during the medieval period. Pliny the Elder (AD 23) was a naturalist. He refers quite often to other medical writers. One cannot help wondering how much of his knowledge was his own, since lots of his works correlate with those of other writers. Galen (AD 131) can be seen as the second-in-charge father of medicine, after Hippocrates. He can be considered as one of the most distinguished practitioners in history. Allopathic, as well as homeopathic systems of medicine are based on Galen's doctrines. Even though one does not know for sure, it is obvious that the ancients had education, even though scientific research was not known.

Traditional healers treat illnesses with plant, animal or mineral products and they consult their ancestors to augment the healing process. They consult the ancestors by ingesting, sniffing or smoking psychotropic herbal substances (Hewson 1998:1030). It is certain that the choice of plants was not based on knowledge of plant constituents, but that scientific knowledge was gained rather accidentally. Some traditional healers indulged in mystical and religious rituals because of fear for the wrong collection and administration of plants. Knowledge could also be gained by watching the effects produced by various plants when eaten by domestic animals. Even today, there are still herbal cures that have not been written down.

Hunters can also be seen as the original custodians of effective traditional herbal recipes. By watching the animals' behaviour, it is possible to learn which plants the animals use. For example, when an animal is wounded, they would follow them to see which plants they would eat. These plants would probably contain a painkiller or even have anti-inflammatory properties (Sofowora 1982:13).

9.7 RELIGION

Roman medicine had a long history of its own, inherited from the Etruscans in both secular and religious aspects, but it was the religious healing that had the more lasting influence. The Etruscan inheritance is shown in the early Roman reliance on divination from the entrails of animals, the use of Etruscan prognostic charts, and the propitiation of the gods to stop epidemics (religious processions to ward off plague continued well into the Middle Ages). As early as the seventh century BC there was a College of Augurs, and for virtually each disease or symptom there was a special divinity. According to legend, the Greek medical deity Asclepios (Aesculapius in Latin) was introduced to Rome in 295 BC in the form of a snake sent from the temple of Epidaurus (Lions 2007).

Traditional medicine also has a sense of superstition and according to Akpata (1979:15) traditional practitioners got their knowledge of traditional cures from witches. Apparently some of the witches (living or dead) attended village markets. If their presence was detected by someone very gifted (such as a traditional healer), the witch promised useful herbal cures in return for not being exposed. Traditional healers also claim that, when in a trance, a spirit of an ancestor who practiced herbalism, would appear and teach them cures (Sofowora 1982:15). It should have to be so clear that, when the traditional healer was sober, he would be able to identify the plant.

9.8 CAUSES OF ILLNESS

The ancients believed that one got sick because of the anger of the gods.

According to the traditional African healers there are five causes why someone gets ill (Sofowora 1982:27):

1. Physical ailments - injurious elements entering the person through food, drinks, the skin or the air being breathed.
2. Psychological causes - diseases caused to man when his will is not in line with the laws of nature.
3. Astral influences - it is known in occult science that the radiations from cosmic agents (sun, moon, planets) have an influence on human beings, either good or bad and evil, eg. lunatics.
4. Spiritual causes - evil thoughts, evil desires and diseases caused by witches.
5. Esoteric causes - diseases originating from the soul, or those caused by the deeds of an individual in his formal life.

It would appear that the concept of disease of the traditional healer is on a wider plane than that of the ancient doctor and the modern practitioner.

9.9 COMPARISON BETWEEN ANCIENT AND TRADITIONAL USES OF EQUIVALENT PLANTS

The following plants will be compared with each other in order to see if the plants of the Northern hemisphere have the same effects as those of the Southern hemisphere. Where possible, the same plant will be compared in terms of its pharmacological uses and to determine whether the plant has the same effectiveness and uses throughout the world. This will be *Datura stramonium* L. and *Withania somniferum* L. The other plants do not grow in both hemispheres, thus the families will be compared. One assumes that the plants which grow in the same family will have the same effects and / or active ingredients. As Iwu writes (1993:169): "For medicinal purposes the distinction between the three species is not considered important since they all yield the pharmacologically important alkaloids". Evans writes (2002:80) that often, such varieties of one genus represent single gene mutations and are morphologically recognisable and often exert the same effects.

9.9.1 *PAPAVER SOMNIFERUM* L.

FAMILY: *PAPAVERACEAE*

According to Lewis *et al.* (1977:446), there are several plants that are used as substitutes for opium. *Lactuca quercina* and *Lactuca virosa* are cultivated in France. The extracted lactucarium, is reputed to be a mild sedative and is used in cough mixtures to replace opium. The people in Thailand chew and smoke the leaves of *Mitragyna speciosa* as a substitute for opium, and the Pakistani's smoke and chew the seeds of *Pterygora alata.* All these plants have a depressing effect on the central nervous system, the reason why they have been selected for their sedative properties.

9.9.2 *MANDRAGORAS OFFICINALIS* L.

FAMILY: *SOLANACEAE*

There is no comparable indigenous plant in South Africa. There is a universal comparable (*Mandragoras autumnalis* L.) (Evans 2002:34), that functions approximately like the mandrake. The mandrake is cosmopolitan in Europe and Asia but not in South Africa.

9.9.3 *HYOSCYAMUS NIGER* L.

FAMILY: *SOLANACEAE*

There is no comparable indigenous plant in South Africa. There are several species of Hyoscyamus, but no one available in South Africa. Other species are:

H. niger var. *α biennis*

β annua

H. albus

H. aureus

H. muticus

H. pusillus

H. reticulatus (Evans 2002: 567).

9.9.4 *CONIUM MACULATUM* L.

FAMILY: *UMBELLIFERAE*

Conium is a genus of two species of highly poisonous perennial herbaceous flowering plants in the family Apiaceae, native to Europe and the Mediterranean region (*C. maculatum*), and to Southern Africa (*C. chaerophylloides* Thunb. (Sond.).

Conium maculatum L. is not indigenous to South Africa but has been recorded only as a weed of cultivation, while *C.chaerophylloides* is not naturalised and indigenous to South Africa (Arnold 2002:16). There are, however, five indigenous species of Conium in South Africa but none of them has the characteristic spotted stems of *C. maculatum*. This plant occurs only in the Western Cape Province as a rare weed of cultivation. The indigenous species are widely distributed, especially in the southern and eastern parts of the country (Van Wyk *et al.* 2002:72). It is especially used for the relief of stomach cramps.

South African Conium contains a high percentage of volatile oil, the main component being myrcene. The alkaloids are similar to those of *C. maculatum* L. but consists, in addition, of *N*-methyl pseudoconhydrine (Evans 2002:390).

9.9.5 *DATURA STRAMONIUM* L.

FAMILY: *SOLANACEAE*

Datura stramonium L. and *Datura tatula* L. are two different species found in South Africa but according to Watt (1963:946), there is a great deal of evidence that they are variations of the same species, as it is often impossible to distinguish the one from the other. The only difference is the flowers. The chief alkaloid found is hyoscyamine. According to Jackson *et al.* (1955:384), there are no differences between the two species and one description includes both species. Hutchings (1996:280) refers to *D. tatula* L. as a synonym for *D. stramonium* L. According to Sofowora (1982:68), the young seedlings of Datura have a higher ratio of hyoscine : hyoscyamine (4 : 5) than the mature fruiting plants in which the ratio is 3 : 10. Thus, the young seedlings would rather have been used.

Datura is a naturalised plant and is not indigenous to South Africa (Germishuizen 2003:914). According to Arnold (2002:129). Datura is only administered to humans.

9.9.5.1 Medicinal and traditional uses

1. Leaves

Infusions of the leaves are sometimes given by traditional healers to the elderly for insomnia. According to Van Wyk *et al.* (2000:162), these infusions can also be used as an aphrodisiac. He also writes that poultices and ointments of the fresh and dried leaves are applied to relieve pain form bruises and wounds, and inflammation, rheumatism, fractures, sprains and to draw abscesses.

The ancients used the fresh leaf as local application to the scalp to calm the hysterical and it provided local anaesthesia when it was applied to a painful area on the body (see Chapter 6.6.2 - Cels. 5.20.3). They also used the leaves of Datura to relief erisypelas (Cels. 5.26.33A, B) and they did not differentiate the usage of fresh or dried leaves (§6.6.2).

The Xhosas apply the leaf on the head for the relief of headache and a fresh, warmed leaf is applied to relieve the pain of rheumatism and gout (Watt 1963:960).

The local application or the warmed leaf is used among the Southern Sotho to apply it to boils and abscesses. It also relieves headaches (Watt 1963:960).

The Zulus steep a leaf in hot water, and put it as a poultice on boils. They also use it as hypnotic against hysteric fits in girls (Hutchings 1996:280).

The dried leaf mixed with Vaseline is a popular Sotho soothing ointment (Watt 1963:960). The Zulus apply the dried, powdered leaf to wounds to draw out inflammation (Hutchings 1996:279).

The Xhosa inhale the vapour of an infusion of the leaf to relieve headache (Watt 1963:960).

Smoke from the burning leaf is inhaled to relief asthma (Watt 1963:960). Van Wyk *et al.* (2000:162) reports that dried leaves can be smoked to induce euphoria, to treat headaches and asthma.

The Southern Sothos use a decoction to bathe bruises (Watt 1963:960). Decoctions of the dried and fresh leaves are used in predetermined doses to sedate hysterical and psychotic patients (Van Wyk *et al.* 2000:162).

2. **Fruit**

The Southern Sotho extract an oil from the fruit and apply it as eardrops to relievie headache (Watt 1963:960). For toothache, a piece of green fruit is inserted into the cavity (Watt 1963:960).

3. **Root**

The ancients used the root as an aphrodisiac (§6.6.5) and in moderate doses, it acted as hallucinogen. In larger doses it acted as a narcotic and overdoses killed (§6.7). Dried and powdered roots were used as consciousness-altering snuff by diviners (Van Wyk *et al.* 2000:162).

4. **Bark**

According to Celsus (5.20.3), the ancients used the bark as an application to foul ulcers. The bruised bark, soaked in wine, was used to induce sleep (§6.6.1). It seems that the traditional healers did not employ the bark.

5. **Juice**

Prominent navels were retracted by the ancients by the application of the juice into the navel (§6.6.7; Celsus 6.15.17.I). It seems that the traditional healers did not employ the juice.

6. **Seeds**

It seems that the ancients did not employ the seeds. Especially rural children eat the Datura seeds (also known as "malpitte" in Afrikaans). This induces severe intoxication and hallucinations. Small amounts are also used to relieve earache (Van Wyk *et al.* 2000:162).

It is actually necessary to remember that there is no right or wrong party. Different traditional healers have different beliefs. From pharmacological chemistry, it is possible to realise which use is current and which indications are only a case of mind over matter.

From the above, it is easy to realise that almost all the plant parts are used for medicinal effects. Interesting enough, it was the ancients that used the bark and the juice of the plant and not the traditional healers of today. This is an indication that the ancients were not as uneducated as we would like to think. The ancients and the Zulu used the fresh leaf to calm hysteria where the ancients and the Xhosa use it as a local anaesthesia topically. The Xhosa and Southern Sotho apply the leaf to the head to relievie headache and both the Sothern Sothoand Zulu apply the leaf to boils. One could assume that if the uses of the ancients and traditional healers relate, it is possible to prove them correct.

9.9.6 *HELLEBORUS NIGER* L.

FAMILY: *RANUNCULACEAE*

Black Hellebore is part of the *Ranunculaceae* family and they are not seen as medicinal plants in South Africa. Watt (1963:69) writes that hellebore is employed as arrow poison, because it is a cardioactive glycoside. Watt (1963:882) gives his opinion and writes that all species of the *Ranunculaceae* family should be regarded as potential irritant poisons.

9.9.7 *WITHANIA SOMNIFERUM* L.

FAMILY: *SOLANACEAE*

Evans (2002:585) writes that there is only one species found, *W. coagulens* L. There is also synonyms for *W.somniferum*; *Physalis somniferum* L. and *Withania microphysalis* Suess. (Arnold 2002:131).

Somniferine is regarded as an excellent hypnotic. *W. somniferum* L. can be classified as a sedative and hypnotic (Watt 1963:1011). Germishuizen *et al.* (2003:918) writes that Withania is an indigenous plant of Southern Africa and it is widely distributed, not only through South Africa, but the world.

1. Leaves

The Xhosa put the leaves on the parts of the body that is affected with syphilis. They also make an ointment for wounds and sores: they boil the leaf in fat and apply it topically (Watt 1963:1010). They also use it for nausea and for the relief of rheumatism, the leaves is pasted to the pain spots (Watt 1063:1010).

The Southern Sotho use the leaves to apply it to bedsores. In the Free State, a paste of the leaf is applied to treat erisypelas (Watt 1963:1010).

Hutchings (1996:273) confirms the indication of syphilis since the Zulu also applied the leaves to the syphilis rash. We also read that the leaves heal wounds of the Swati since the leaves have an antiseptical effect, especially for the treatment of eruptive diseases like smallpox (Iwu 1993:259).

2. Fruit

The green berry is bruised and the juice is applied to a ringworm under the skin (Watt 1963:1010) but the ancients used it as a diuretic (§7.8.8).

3. Root

The ancients drank 0.05g of the pounded root to feel happy and experience an energy boost. After 0.1g, the person had delusions, and with 0.2g, he died (§7.7.2).

The Southern Sotho make a decoction of the root for colds and chills. The uterus of a Transvaal-Sotho woman is purged with the root decoction when it is vaginally administered after a miscarriage (Watt 1963:1010).

A decoction of the root is used by the Xhosa to treat heamorrhoids internally and externally and the root is also used for diarrhoea and proctitis (Watt 1963:1010). The powdered root is mixed with fat and used as ointments for infected sores and abscesses (Watt 1963:1011).

An enema is administered of the decorticated root when a Zulu infant is feverish (Hutchings 1996:273; Iwu 1993:259).

4. Bark

The Southern Sotho believe that an infusion of the bark relieves asthma (Watt 1963:1010). When the ancients mixed the bark with wine, and it was kept in the mouth, it relieved toothache (see chapter 7.8.6).

5. Juice

The ancients believed that the juice relieves dim-sightedness (§7.8.8), but the Xhosa apply fresh leave-juice to an anthrax pustule (Watt 1963:1010).

6. Rootbark

The ancients drank a decoction of rootbark mixed with wine to induce sleep (§7.8.1). The Xhosa use the rootbark internally to treat syphilis (Hutchings 1996:273). A decoction of the rootbark is inhaled in asthma and other chest complaints (Watt 1963:1010).

7. The whole plant

In South Africa, the Sothouse the plant as antihelmintic and also as part of their rituals in witchcraft. The Xhosa and Pedi-tribes also use the plant to disinfect meat which is infected with anthrax. We also read that traditional healers use the plant in the treatment of asthma and bronchial diseases, syphilis and other veneral diseases as well as a remedy for "black gall-sickness and as general wound dressing (Iwu 1993:259).

9.9.7.1 Medicinal and traditional uses

The ancients definitely used *W. somniferum* as narcotic drug, to relieve pain and toothache. It is difficult to see a correlation between the usage of the ancients and the traditional healers. The traditional healers focus on relief of syphilis, which is very often experienced due to the high frequency of sexually transmitted diseases in South Africa. Other South African indications are fever, colds and flu, asthma, general ill health and debility, infections, abdominal discomfort, diarrhoea, typhus, typhoid, proctitis and worms (Van Wyk *et al.* 2000:150).

9.10 CONCLUSION

The African continent is reported to be the continent with the highest deforestation in the world, which implies that African medicinal plants are rapidly lost from their natural habitat. This will make it very difficult in a few years' time to have any insight in African herbalism. At this rate, we will only read of traditional healers, and herbal medicine, as we already do with e.g. the Dodo in Mauritius.

The knowledge of the traditional healer is based on observation and trial and error. There were no books available into which their knowledge could be annotated. The knowledge of the traditional healers were passed on from one generation to another. According to Van Wyk *et al.* (2000:07), ethnobotany (the study of the use of plants by local people), is still an undeveloped discipline in South Africa and research on indigenous plants needs urgent scientific documentation before it gets lost for future generations. Knowledge of the plants in modern science is based on scientific research, and with the knowledge of phytochemistry and pharmacology assumptions can be made successfully.

Van Wyk *et al.* (2000:07) is very concerned when they write that with the development of chemical drugs, education and modern health care, the decentralisation of rural areas to cities and migrating labour, the knowledge of traditional plants used for specific diseases is getting lost. Changes in the socio-cultural and environmental landscapes have severely eroded the indigenous knowledge base. For traditional healers, not all the medicinal plants can be explained in terms of Western science, since the energetic, spiritual, ritual and symbolic aspects are fundamentally important (Van Wyk *et al.* 2000:119).

Psychotropic plants are still used by all societies, even though they are not considered the psychoactive drugs they indeed are. Plants that were used in antiquity as narcotics are not necessarily used as narcotics in modern pharmacy. With scientific research, it would rather be used as a purge, or even exhibit antibiotic properties rather than narcotic properties. The combination in which the ancients used their drugs, must also be seen as a whole, where traditional healers would rather use plants in monotherapy for a specific indication. Indications in South Africa would rather be drugs used for purges and laxatives, since the traditional healers believe that a clean body is a healthy body.

Several other examples similar to those referred to above can be given and cited, all pointing to the fact that certain practices and remedies used by traditional healers are capable of being rationalised scientifically. The traditional healer's explanation or even view as to why their practices work, may not however, coincide with the scientific evidence. The true extent of the use of psychoactive drugs in South Africa is not fully known. Many know the magical and charming effects of certain plants, but with the very fast acculturation that takes place, the knowledge of most of these plants has become fragmentary.

There are still such a lot of plants that need to be rediscovered in South Africa, mainly due to the fact that there is no written information available. Scientific studies are still necessary to reveal "new" medicinal plants with a thorough explanation of phytochemistry and pharmacology. Even interviews with remaining traditional healers can be a possibility to start an indepth study on the use of certain drugs.

CHAPTER 10
SIMPLES FOR PAIN AND SLEEP

The following chapter is inserted because of its necessity to explain why it is possible that the ancient recipes could be effective. All the plants mentioned in this chapter exert either soporific or analgesic properties. This would explain why the recipes would be effective, since there would be several ingredients in the recipe, each with a soporific and/or analgesic effect. This can actually be seen as a glossary.

Absinth *Artemisia absinthium* L.

English - Wormwood

Zulu – Umhlonyane

Pliny writes that Absinth induces sleep if it is inhaled through the nose or placed under the pillow (Plin. *H.N.* 27.52). The wormwood is specific for the troubles of women (Plin. *H.N.* 25.73, 26.151) since it draws down the menses (Plin. *H.N.* 21.135, 27.51; Diosc. 3.23.2). According to Dioscorides wormwood has astringent (See also Plin. *H.N.* 27.48) and warming properties and purges bile (Diosc. 3.23.1 p188, Plin. *H.N.* 27.48). It is also a diuretic (Cels. 2.24.3; 2.31; 3.21.5; 3.24.2; 4,7.3; 4.12.2; 4.12.6; 4.16.2; 4.18.5; 4.15.3; 4.18.5; 5.25.16; Plin. *H.N.* 22.65, 27.50), and anti-emetic (Plin. *H.N.* 27.48). It is also used for flatulence and abdominal pains (See also Plin. *H.N.* 22.147, 27.45, 27.48). It was also used to treat jaundice (See also Plin. *H.N.* 23.146, 27.49) and to improve appetite (Diosc. 3.23.1 p188). It was used as a successful antidote for poisonous mushrooms, pine thistle, hemlock and bites of the shrew mouse (Diosc. 3.23.2 p188; Plin. *H.N.* 27.50). It is used with honey and soda as an unguent for sore throats and with water, for pustules that are most painful at night (Diosc. 3.23.2; Plin. *H.N.* 27. 52), but for black eye and dim-sightedness it is used with honey and similarly for purulent ears. The vapour of its decoction is used for earaches, and boiled down with grapesyrup, it is a poultice for very painful eyes (Diosc. 3.23.2 p188, Plin. *H.N.* 25.145, 27.50). For dropsy, Pliny prescribes a decoction of wine, wormwood and barley meal (Plin. *H.N.* 23.123).

It is plastered on chronically unwell hypochondria, liver and stomach and promotes digestion (Plin. *H.N.* 27.48; Diosc. 2.23.3). It is also suitable for people with spleen disease and for those with edemata. During the summer they drink it as an aperitif believing that it brings about good health (Diosc. 3.23.3 p189). Boiled down, it destroys intestinal and round worms and purges the bowel gently (Diosc. 3.23.5 p189; Plin. *H.N.* 27.48; Cels. 4.24.2). Pliny adds that it relieves toothache (Plin. *H.N.* 20.15), and quinsy (Plin. *H.N.* 27.51).

- Modern description:

People had been using decoctions of the flower heads of this group of plants (known as Artimesia) to rid themselves of intestinal worms and parasites. The active principle in the oil responsible for analgesia is α-santonin (responsible for the anti-helmintic effects) (Taylor 1965:44), but there is also a large amount of coumarins, scopoletin, isoscopoletin and hernarin present (Hutchings 1996:326). It is also used as a bitter tonic and for flavouring vermouth (Manzi *et al.* 2000: 68:316), it also purges bile (Bisset 1994:46). Artemisia is also known for the **narcotic** and debilitating effects and the terpenoid thujone causes excitement of the CNS, which eventually leads to unconciousness and death (Hutchings 1996:326), and it also has **analgesic** properties (Holleman 1998:234)

The azulenes are anti-inflammatory (Mills 1991:437), and the water soluble extract was shown to be antipyretic in rabbits. The constituent thujone is highly toxic and it has hallucinogenic and addictive properties. It interacts with a receptor in the CNS, the same as that of tetrahydrocannabinol, the active ingredient of Hemp. It is also used as a flavouring agent in liquors (Williamson 2003:459).

Acacia BARK *Acacia arabica* Willd

English - Babul bark, Wattle bark

Afrikaans - Akasia, Doringboom

Ndebele - Isangwe, Umtshanga

The acacia has astringent and cooling properties (Diosc. 1.101.2; Plin. *H.N.* 24.110). The juice is suitable for eye diseases (Diosc. 1.101.2; Plin. *H.N.* 24.110) and for erysipelas, for shingles, chilblains and membranous growths over the eyes (Diosc. 1.101.2). It stops leucorrhea, it draws in prolapses of the uterus (Diosc. 1.101.2) and

anus (Plin. *H.N.* 24.110), and when drunk or when used as a clyster, it stops diarrhoea (Diosc. 1.101.2). The decoction of this thorny plant, when poured over weak joints, firms them (Plin. *H.N.* 20.110; Diosc. 1.101.3). It has properties that stop the pores and that take off the edge of sharp drugs with which it is mixed, and when smeared on with egg, it prevents the formation of blisters on burns (Diosc. 1.101.3). Pliny adds that it is given to patients who spit blood (Plin. *H.N.* 20.22, 20.233) and those who suffers from creeping ulcers, gatherings and hangnails, as well as for sores of the mouth and genitals (Plin. *H.N.* 24.110).

- Modern description:

Only the bark is used. It is seldom used as an astringent, but it helps to fasten loose teeth and to heal ulcers in the mouth (Williamson 2003:4).

Shittim Wood, a variety of *A. arabica* was traditionally used to build the Holy Tabernacle and the furniture because of the availability of the wood and its hardness (Williamson 2003:4).

The Zulu use bark decoctions for dry coughs and to loosen phlegm (Watt 1962:540).

Acacia GUM *Acacia senegal* L.

English - Gum acacia, Gum arabic, Gum senegal, Black thorn tree, Redheart tree, Scented thorn tree

Afrikaans – Snuif/stinkpeul, Soetlekkerruikpeul

Ndebele - Umhlahlalinye

Sotho – Motse

Tswana – Moshu, Sinzi

Zulu – Indwedwe, Isinga, Isithwethewe, Ubobe, Ubombo, Umnqawe, Umqawe

Swahili - Kikwata mgunga

See Acacia bark for ancient indications (Diosc. 1.101).

The gum mucilage from this, which included astringent tannin, was used to arrest bleeding and agglutinate wounds (Cels. 5.1.1), as an exedent (Cels 5.7), and

generally as an astringent gum in eye salves and lozenges. The juice was also used (Cels. 6.6.K footnote a) to **assure better sleep**.

- Modern description:

The high molecular weight polysaccharides give it the property as mucilage (Grieve 1931:4) it is used to make oil-in-water emulsions (Mills 1991:374). It is used widely in the food industry as a stabilizer and flavour fixative (Williamson 2003:4). It is also a pharmaceutical aid as additive for solid formulations (Van Wyk *et al.* 2004:29).

Acacia gums are usually formed from the cell wall and consist of monosaccharides and uronic acid. Mucilage is an organic constituent and is especially found in the root, bark, seed, flower and leaf. The pod case, leaves and interflorescense are rich in tannin and the plant contains saponin (Watt 1962:546). Gum acacia consists mainly of arabin and the calcium salts of arabin, potassium and magnesium and peroxidases, enzymes which oxidise organic compounds easily. Gum acacia is used as an emulsifier, in tablet production and in suspensions as it thickens the suspension (Hoffman 2003:51). According to Scarborough (1995:9), acacia is used where flavour stability and long shelf life are important.

Achillae *Achillae millefolium* L.

English - Milfoil, Nosebleed, Yarrow, Woundwort

This plant has a medicinal scent and is used to close bleeding wounds (see also Plin. *H.N.* 25.42, 26.131). It relieves inflammations, and can stop bleeding, including uterine bleeding (Diosc. 4.36; Plin. *H.N.* 26.151). In a decoction it is used as sitzbath for women who suffer from discharges. It is also drunk for dysentery (Diosc. 4.36; Plin. *H.N.* 26.51) and relieves earache (Plin. *H.N.* 25.164).

- Modern description:

According to Moerman (2005:131), this plant is used internally and externally to treat pain in several different forms, including headache, body ache and chestpain. The yarrow is used as antipyretic and anti-inflammatory. The sesquiterpenes are anti-inflammatory and the flavonoid content induces anti-spasmodic actions (Van Wyk *et al.* 2004:30). Apigenin, azulene and the salicylic acid also have anti-inflammatory effects (Williamson 2003:462). The cyanogenic glycosides and isovalerianic acid have sedation action (Mills 1991:399) and the pyrrolidine alkaloids (betonicine and

stachydrine) have anti-pyretic effects (Van Wyk *et al.* 2004:30). The herb is also traditionally used to treat arthritis and it is added to the bath water to treat pelvic autonomical dysfunction[339] (Van Wyk *et al.* 2004:30).

Acoron *Acorus calamus* L.

English - Sweet sedge, Myrtle flag, Sweet flag, Sweet calomel

Afrikaans – Makkalmoes

Zulu – Ikalmuzi, Ikhalamusi, Indawolucwatha, Ikalamuzi

Dioscorides ascribes the following properties to sweet flag: "it can set urination in motion (see also Plin. *H.N.* 26.80) and is useable for those who suffer from edemata, for kidney disease, people who suffer from strangury and for ruptures. It draws down the menses, relieves coughing and it is boiled down for women's sitzbaths" (Diosc. 1.18; Plin. *H.N.* 26.160).

Pliny writes that it is good for cataract and dimness of the eyes, and acoron is a powerful calorific and discutient; it is also taken for snake bites (Plin. *H.N.* 25.158). It is also an earache reliever (Plin. *H.N.* 25.164) and relieves pains in the chest (Plin. *H.N.* 26.28) and it is also a cure for liver diseases (Plin. *H.N.* 26.35), colic and flatulence (Plin. *H.N.* 26.74). The roots are very useful for trouble of the hypochondria and groin (Plin. *H.N.* 26.77) and an application of the roots reduces swelling (Plin. *H.N.* 26.91, 26.127). The root is also used for fever (Plin. *H.N.* 26.137).

The rhizome was dried and eaten, or the oil pressed out of it; it is included among diuretics, as an ingredient in an antidote (Cels 5.23.3), and perhaps (under the name of *Calamus alexandrinus*) in an **anodyne** salve (Cels. 5.23.3).

- Modern description:

The root is an **anodyne** (Williamson 2003:88) **and sedative** (Holleman 1998:230) due to the asarone and α-pinene in the volatile oil. When chewing the root, it alleviates toothache (Weiner 1980:213). β-asarone (phenylpropanoid) is the main compound of the essential oil and exerts sedative (Newall *et al.* 1996:55) and hypothermic effects. Other monoterpenoids found are camphene, p-cymene and linalole. Acorenone (sesquiterpenoid) is also found (Van Wyk *et al.* 1997:28) and it

[339] Painful cramp-like conditions of the lower pelvis in women (Van Wyk *et al.* 2004:30).

induces the effects on behavioural activities of cannabinoids (Zanoli *et al.* 1998:S115). Toxicity is ascribed to β-asarone (Van Wyk *et al.* 1997:28).

A bitter glucoside acorin as well as an alkaloid calamine and saponin are present. The plant has proved to have a weak antypyretic action (Watt 1962:113) and is also a potent hypotensive (Miller *et al.* 1998:154).

In the Cape Province in South Africa, the root is used as a carminative and as a remedy for diarrhoea (Watt 1962:112). The Zulu also used it for dyspepsia and the rhizome for chest colds and nervous disorders (Hutchings 1996:22).

Anise *Pimpinella anisum* L.

Afrikaans - Anys

Zulu - Ibeka

Pliny writes that anise relieves sleeplessness (Plin. *H.N.* 20.186) and promotes sleep when it is taken in a drink (Plin. *H.N.* 20.189). Dioscorides describes the properties as a warming effect (increasing perspiration), making the breath sweet. It allays pain, disperses substances (see also Plin. *H.N.* 20.187), promotes urination and induces relaxation. It acts as antidote for the venom of animals (and scorpions, see Plin. *H.N.* 20.185, 20.264) and for inflations. It stops diarrhoea and leucorrhea; it promotes breast milk and is seen as an aphrodisiac. The fumes stop headaches (See also Plin. *H.N.* 20.190), treat the discharges of the ears (Diosc. 3.56 p 206; Plin. *H.N.* 20.188) and also relieve quinsies (Plin. *H.N.* 20.188, 20.249)

Aniseed is used against flatulence (see also Plin. *H.N.* 20.189), and as a diuretic (Cels. 2.26; 2.31; 3.24.2; 4.17.2) but it also relieves fluxes of the eyes (Plin. *H.N.* 20.187). Anise clears phlegm on the chest (Plin. *H.N.* 20.188), stops hiccoughs, sneezing, disperses stones, stops vomiting and swelling of the hypochondria (Plin. *H.N.* 20.189). According to Pliny, different ancient doctors and herbalists prescribed anise for lumbago, dropsy, coeliac trouble, kidney diseases, for woman in labour, for those who have pain in the womb, phrenitis (Plin. *H.N.* 20.191), or babies who suffer from epilepsy and convulsions (Plin. *H.N.* 20.192). Pythagoras also gave it to people who suffered from fatigue and Heraclides for orthopnea (Plin. *H.N.* 20.193). Vertigo is expelled after childbirth and it relieves diseases of the joints (Plin. *H.N.* 20.195).

- Modern description:

This herb is not safe to use during pregnancy and it is used as an expectorant by exerting a direct stimulating effect on the bronchial tree by means of local irritation. Its ability to relax bronchi helps to cure whooping cough as well as persisting coughs. (Wallace 1998:65). It is an antispasmodic which relaxes muscle spasms throughout the body, due to the anethole content (Van Wyk *et al.* 2004:240). The volatile oil content is approximately 1 - 4, 5% consisting of 80% trans-anethole as well as photoanethole and dianethole. This volatile oil eases flatulence, colic and griping. It helps to control lice and scabies externally. The mild estrogenic effects are also due to the volatile oil which enhances the libido. It also facilitates birth and increase milk secretions.

Other constituents are coumarins (bergapten, umbelliferone and scopoletin), flavonoids (rutin, isovitevin, quercetin, luteolin, apigenin, and glycosides) and phenylpropanoids (Hoffman 2003:572). A hot water extract of the dried anise seed produces an **analgesic** effect (Ross 2001:365) and **depresses the CNS activity** (Ross 2001:367).

It is used as a flavouring and spice and the anethole is also known to have anti-inflammatory effects (Williamson 2003:22).

Barley *Hordeum vulgare* L.

English - Pearl barley, Perlatum

Pliny gives several references to the analgesic and anti-inflammatory effects of barley meal. He writes that barley is used for pains in the liver, when pus needs to be matured (Plin. *H.N.* 22.122) and for inflammations of the tendons or the intestines or pains in the sides (Plin. *H.N.* 22.123, 23.3). Dioscorides and Pliny write that barley meal dissolves swelling and dissipates inflammation (Diosc. 2.86.2; Plin. H.N. 20.122). Barley is a fit application for rheums of the joints and it assuages inflammations (Diosc. 2.86.3).

It also cures running sores and scurf (Cels. 6.2) on the body, stomach ache, and affections of the feet and of the breasts (Plin. *H.N.* 22.125), and it relieves headache (Plin. *H.N.* 22.125, 23.3) and gout (Plin *H.N.* 22.135; Diosc. 2.86.2).

Other indications of barley are to reduce pustules (Plin. *H.N.* 20.103) and to relieve the pain of multipede stings and snakebites and to stop suppuration (Plin. *H.N.* 20.122). It matures abscesses and chronic sores, reduces scrofulous swellings, swelling of the hypochondria and any kind of fever (Plin. *H.N.* 20.123). It blemishes freckles and is used when somebody spits blood or have tracheal afflictions (Plin. *H.N.* 20.124), or coughing (Plin. *H.N.* 20.125). The juice is made into lozenges and taken as suppositories for ulcerations of the intestines and of the uterus. Barley ash is applied to burns and it is used for eruptions of phlegm and for bites against the shrew-mouse. It is also an excellent emmenagogue (Plin. *H.N.* 20.134), relieves catarrhs (Plin. *H.N.* 23.78) and dropsy (Plin. *H.N.* 23.123).

More indications are discussed in Plin. *H.N.* 24.29, 39, 55, 62, 97, 149, 186. 25.83, 85, 90, 156, 26. 83, 85, 90, 159, 27.24, 90, 97, 108, 137, 28.81, 137,166, 183, 206, 264, 29.40, 143, 30.38, 75, 97, 113, 122, 31.63, 103, 32.36, 78, 110, 137, 33.108, 34.170, 35.181.

- Modern description:

According to Hartwell (1967), barley is used in folk remedies for cancer (especially. of stomach and uterus), and tumours of the abdomen. The seed meal is a folk remedy for cancer of the uterus, inflammatory and sclerotic tumours and gatherings, and parotid gland tumors. The seed flour is used for condylomata of the anus, tumours behind the ears, scirrhus of the testicles and spleen, and whitlows. Cataplasms derived from the seed are also believed to help breast cancers (Hartwell, 1967–1971). Other folk medicinal details are presented in *Medicinal Plants of the Bible* (Duke, 1983). Powdered parched grains are used in the form of gruel for painful and atonic dyspepsia. Barley water with honey is prescribed for bronchial coughs and with gum Arabic (myrrh) used for soothing irritations of the bladder and the ureters (Williamson 2003:44).

Betony *Stachys officianalis* L.

English - Bishopswort, Wood betony

"One drachma of the leaves is given with either hydromel or water for spasms and ruptures" (Diosc. 4.1.2). "A weight of three obols is given with one cyathos of tepid and diluted wine to those with hip ailment" (Diosc. 4.1.4).

- Modern description:

The alkaloids; stachydrine and betonicine give this plant a sedative property. It is also used, either alone or in combination for nervous headaches (Grieve 1931:98), neuralgia and anxiety (Williamson 2003:455).

According to Gabel (1998:223), betony is a sedative and calming to the nervous system, fearfulness and exhaustion.

Birthwort *Aristolochia rotunda* L.

Latin - *malum terrae* - earthapple (Plin. *H.N.* 25.95)

Dioscorides used birthwood for muscle spasms and for **pains** in the sides (Diosc. 3.4.5), but Pliny prescribes the smell of birthwort, or by bathing in it for sleeplessness (Plin. *H.N.* 26.111). Latin writers considered birthwort as "excellent for women in childbed" (Plin. *H.N.* 25.95, 26.154). It is used against snakebites (Plin. *H.N.* 25.97). It is very beneficial for sprains, bruises and for pain when someone jumped from a high place (Plin. *H.N.* 26.137). The root is taken in water for pleurisy and sinews. The seed is a tonic and has a warming effect (Plin. *H.N.* 25.98). Birthwort is also prescribed for stomach-diseases (Plin. *H.N.* 25.101, 128, 143; 26.32-33).

For other indications of birthwort, and the use of birthwort in combination with other plants, see Pliny (*H.N.* 25. 119, 134, 141, 165, 166 and 26. 41, 53, 75, 90, 117, 126, 142, 154).

- Modern description:

Extracts of the root are anti-inflammatory. Birthwort is a stout plant and is bitter to taste: it is black in colour and fragrant; the leaf is round. However there is not much of the plant above ground. It grows especially on mountains, and then it is best. Many uses of it for various purposes are enumerated; it is best for bruises on the head, good also for other wounds, against snake-bites, to produce **sleep**, for the womb as a pessary: for some purposes it is soaked with water and applied as a plaster, for others it is drunk in sour wine and also sprinkled over the bite; to induce sleep it is given pounded up in black dry wine: in cases of *prolapsus uteri* [340] it is used in water as a lotion (Williamson 2003:54).

---

340 Prolapsed uterus

Bitter almond *Prunus Amygdalus var. amara* (*Prunus africanus* L.)

Afrikaans – Bitteramandelboom, Rooistinkhout, Nuwe amandelhout

English – Red stinkwood

Zulu – Inyazangoma-elimnyama, Umdumezulu, Umdumizula, Umkhakhazi

Dioscorides and Pliny write that bitter almonds induce sleep and can thus be seen as a soporific. Both also agree that it allays pain, especially headaches and pains of the kidneys and liver. They also agree on the following indications: it relieves pustules that are most painful at night, and it is combined with honey for decaying sores, pain of dog bites and it is diuretic. (Diosc. 1.123.1; Plin. *H.N.* 23.144). It relieves the pain of those who suffer from stones, it helps for liver disease, for coughs (Diosc. 1.123.1; Plin. *H.N.* 23.145).

They also prevent drunkenness (Diosc. 1.123.2; Plin. *H.N.* 23.145).

Dioscorides also gives more indications of the bitter almond: "applied as pessaries, it brings on the menses, and with wine for shingles. When eaten it softens the bowel and relieves flatulence in the colon" (Diosc. 1.123.1). It is taken with starch and mint for blood spitting, it is drunk with water or licked as a lozenge with turpentine for kidney disease and inflammations of the lungs, with grape syrup it helps those having difficult micturition, it removes lichen-like eruptions, and it treats chronic coughs and heartburn (Diosc. 1.123.2).

Pliny adds that the bitter almond stops haemorrhage and it acts as an emmenagogue. It relieves lethargy, epilepsy, epinyctis (Plin. *H.N.* 23.144), strangury and colic (Plin. *H.N.* 23.145).

- Modern description:

According to the British Pharmaceutical Codex the bitter almond is broader and shorter than the sweet almond and contains about 50% of the fixed oil which also occurs in sweet almonds. It contains the enzyme laccase which, in the presence of water acts on a soluble glucoside, amygdalin, yielding glucose, cyanide and benzaldehyde C_6H_5CHO, the essential oil of bitter almonds. Bitter almonds may yield from 6% - 8% of hydrogen cyanide. Extract of bitter almonds were medicinally used but even in small doses effects are severe and in larger doses it can be deadly. The prussic acid must be removed before consumption.

The bitter almond applied to the head is said to kill lice (Watt 1964:891).

Almond oil is mainly used for its flavour and as an emollient. The amygdalin (constituent of the oil) is toxic and high doses cause CNS depression and respiratory failure (Williamson 2003:14).

Black bryony *Tamus communis* L.

English - Blackeye root

Dioscorides had a recipe for the leaves, made into a poultice with wine to apply on sprains (Diosc. 4.183.2). Black bryony berries have the same effects as the Bryony (*Bryonica dioica*) but the black one is not as potent as the plain bryony. The bryony dissipates inflammations (Diosc. 4.182.2), and the bryony lozenge is given to those who have a pain in the side, for ruptures, and for spasms (Diosc. 4.182.3).

Pliny writes that bryony promotes urine and reduces the size of the spleen (Plin. *H.N.* 23.27). It extracts splintered bones and it prevents blood clotting (Plin. *H.N.* 23.28).

The root of the 'wild vine' (bryony) is also heating and pungent: wherefore it is useful as a depilatory and to remove freckles: and the fruit is used for smoothing hides (Theop. *H.P.* 9.20.3).

- Modern description:

Bryonolic acid induces apoptosis (removal of damaged or old, unwanted cells through phagocytosis by macrophages and/or neutrophils (Hoffmann 2003:163). Black bryony is mainly used as a rubifacient and diuretic. The expressed juice of the

fresh root, mixed with a little white wine, has been used as a remedy for gravel,[341] being a powerful diuretic. The expressed juice of the root, with honey, has also been used as a remedy for asthma. The berries act as an emetic, and children should be cautioned against eating them. The scraped pulp was applied as a stimulating plaster, and in gout, rheumatism and paralysis it has been found that it **relieved pain** and induced blood flow. Black Bryony is a popular remedy for removing discoloration caused by bruises and black eyes (Grieve 1931:130).

The scrapings of the fresh root acts as anti-inflammatory when it is rubbed into parts that is affected by gout (Williamson 2003:72).

Broom *Cytisus scoparius* L.

English - Scotch broom, Irish broom, Broomtops, Besom, Scoparium

According to Pliny, a broom potion was given to women who breastfed their babies to prevent their milk from drying (Plin. *H.N.* 13.131).

- Modern description:

Broom contains two principles on which its activity depends, sparteine and scoparin (Iwu 1993:168). Sparteine is a transparent, oily liquid, colourless when fresh, turning brown on exposure and it has a very bitter taste. It is slightly soluble in water, but more in alcohol and ether. Scoparin, the other principal constituent, is a glucoside, occurring in pale yellow crystals, colourless and tasteless, soluble in alcohol and hot water. It represents most of the direct diuretic activity of Broom.

Sparteine forms certain salts of which the sulphate (official in the British and the United States Pharmacopeias) is most used in medicine. Oxysparteine (formed by the action of acid on sparteine) is used as a cardiac stimulant. Two other alkaloids, sarthamnine and genisteine are also found (Watt 1964:592).

Broom has a diuretic and cathartic effect. Broom tops are used in the form of decoction and infusion as a feeble diuretic, generally in dropsical complaints of cardiac origin. The action is due to the scoparin contained (Iwu 1993:168).

---

341 Small concretions, usually of uric acid, calcium oxalate, or phosphates, formed in the kidney and passed through the ureter, bladder, and urethra (Stedman's Dictionary 2006).

A compound decoction of Broom is recommended in herbal medicine as of much benefit in bladder and kidney affections, as well as in chronic dropsy. It is found that sparteine produced a transient rise in arterial pressure, followed by a longer period of decreased vascular tension, which results in a hypertensive effect (Miller *et al.* 1998:154). Small doses slow the heart for a short period of time and then hasten its rate and at the same time increase the volume of the pulse. Those who advocate its employment claim that it is a useful heart tonic and regulator in chronic vulvular disease.

In large doses, sparteine causes vomiting and purging weakens the heart, depresses the nerve cells, lowers the blood pressure, and has a strong resemblance to the action of coniine (Hemlock) on the heart. Death is caused by impairing the activity of the respiratory organs. Shepherds have long been aware of the **narcotic** properties of broom, due to sparteine, having noticed that sheep after eating it become at first excited and then stupefied, but the intoxicating effects soon pass off (Grieve 1931:130).

It is mainly the flowering tops that are used and these contain quinolizidine alkaloids. Due to the isoflavone glycosides, it is used for several cardiac problems (Williamson 2003:71).

Cardamom *Elattaria cardamomum* White&Malen

Dioscorides (1.6) wrote that cardamom is good for ruptures, muscle spasms and colic. According to Celsus, the seeds (brought from Malabar and Sri Lanka) produce an aromatic oil, used internally as a diuretic (Cels. 3.21.7), and externally as a counter-irritant, agglutinant, erodent and emollient (Cels. 5.2; 5.6.1; 5.15).

- Modern description:

The fruits and seed are the main plant parts used. The volatile oil acts via the muscarinic receptor and has an analgesic effect. The oil also potentiates the effects of indomethacin (an anti-inflammatory) by enhancing transdermal properties. It is also used as a food-flavouring agent (Williamson 2003:95). Cardamom is a stimulant, which means that it quickens an activity as well as the physiological action in the body. The digestive system is stimulated (Hoffmann 2003:520) and it also acts as a carminative when it relaxes the gastrointestinal tract (antispasmodic) (Hoffmann

2003:494) and eases discomfort caused by flatulence (Hoffmann 2003:502) due to the monoterpene content (Van Wyk *et al.* 2004:131).

Cassia *Cinnamomum cassia* Bl.

Beck writes that both cassia and cinnamon are species of *Cinnamomum cassia* Blume, commonly referred to as cinnamon. Cassia is the name of the Chinese species while cinnamon is the Malayan (Beck 2005:13). However, Rackham (1952:62; Pliny Vol. 4) differs. He writes that *Cassia* was the wood, bark and root and *Cinnamomum* the tender shoots and flower-heads.

Cassia has warming, diuretic, desiccative (see also Plin. *H.N.* 25.175) and mildly astringent properties. It is suitable for eye medications and for emollients. It removes birthmarks, induces menstruation and is used when someone is bitten by a viper. It is drunk for internal inflammations and pain in the kidneys. Womean use it for sitzbaths and the fumes dilate the cervix (Diosc. 1.13.3).

- Modern description:

Cassia prevents and controls elevated glucose and blood lipid levels by enhancing insulin sensitivity, mediated by polyphenols. The active polyphenols from cinnamon increase the insulin receptor kinase and inhibits insulin receptor phoshatase with an associated increase in the phosphorylation of the insulin receptor. Increased phosphorylation of the insulin receptors leads to improved insulin function and improved insulin sensitivity. Polyphenols from cinnamon increased glucose uptake, glycogen synthesis and glucose utilisation during a glucose clamp study in rats. Hypertension was also decreased (Anderson 2005:3). There is also evidence that cassia has a strong effect in lowering blood pressure. High amounts consumed can be toxic to the liver due to the coumarin component in cassia (Harris 2006:21).

The bark is used but the oil is distilled from the leaves and twigs. The oil is used for the flavouring of medicine and food, but cassia also exerts an analgesic effect (Williamson 2003:100).

Castor *Ricinis communis* L.

Latin - Cici, Croton, Sibi, Wild sesamum

Afrikaans – Kasterolieboom

Northern Sotho – Mokhura

Xhosa, Zulu - Umhlakuva

Swahili - Mbono, Nyonyo

The seeds purge the bowels (see also Plin. *H.N.* 23.83) of phlegm, bile and water and induces vomiting (Diosc. 4.161.2). The seeds remove facial eruptions and freckles and it promotes hairgrowth (Plin. *H.N.* 23.83-84; Diosc. 4.161.2).

The leaves stop swelling, inflammations of the eyes, swollen breasts and quench erysipelas (Diosc. 4.161.2). It is good for diseases of the joints and for all indurations of the uterus, anus, ears and burns (Plin. *H.N.* 23.83).

- Modern description:

Plant toxins that are found in the castor bean are lectins, such as ricin, and an alkaloid (ricinine) (Van Wyk *et al.* 1997:216). Ricin inhibits protein synthesis by inactivating the ribosome. The bean is very poisonous to humans and animals. When the seed is swallowed and not chewed, it is harmless but if the bean is chewed, the ricins will poison the intestines. When chewed the person will vomit and experience diarrhoea which can lead to dehydration and death.

The bean will also cause contact dermatitis when it is in constant contact with the skin. An extract of the seed does not have any analgesic effect, but the extract of the bark of the dried root engenders **analgesia** (Ross 2001:380).

Castor oil can be used externally as a lotion but when it is consumed, it acts as a laxative. Pancreatic enzymes release ricinoleic acid in the small intestine which reduces the absorption of salts, electrolytes and fluid. When intestinal peristalses are stimulated, fluid will accumulate and evacuation takes place very quickly (Hoffmann 2003: 206).

The oil is expressed out of the leaves and seeds. The seed contains the alkaloid ricinine and the leaves, ricinine and N-demethylricinine. The oil acts as emollient and soothes the skin and eye (Williamson 2003:101).

Celery *Apium graveolens* L.

Afrikaans - Seldery

It seems as if there was not a definitely difference between parsley and celery. Jones (1951:156; Pliny Vol. 6) also indicates that both must be understood. In this studyonly specific references to celery will be discussed.

According to Dioscorides, celery is suitable for inflammations of the eyes; it allays heartburn, relaxes swollen breasts and is diuretic (Diosc. 3.64.1; see also Plin. *H.N.* 20.253, 24.85). It counteracts deadly poisons, it is emetic and antidiarrheic (Diosc. 3.64.1). The seeds act as dissolvent for flatulence, it is mixed with analgesics and with cough medicine (Diosc. 3.64.1). Theophrastus writes that it is also used in cases of strangury[342], and for those suffering from stones (Theop. *H.P.* 7.6.3). Pliny adds that it is used for jaundice (Plin. *H.N.* 27.49).

- Modern description:

It is usually used to treat arthritis but it may cause photo-dermatitis (due to the furanocoumarin constituents (Miller *et al.* 1998:314) and allergy. This herb is also contra-indicated in kidney inflammation (Beckwith 1998:108). It also affects the blood glucose and is thus very useful to diabetic patients (Miller 1998:115), but it is also a mild hypotensive (Miller *et al.* 1998:154). Celery has a **sedative property** without exposing the patient to the risk of getting addicted (Holleman 1998:230).

The stem of the celery plant is mainly used for its sedative and anti-inflammatory effects. The phthalides (mainly 3-n-butylphthalide, ligustilide, sedanolide and sedanenolide) are sedatives (Newall *et al.* 1996:65). While an aqueous extract reduces adjuvant-induced arthritis, the ethanolic extract acts as anti-inflammatory in rats. This extract also protects against gastric damage by non-steroidal anti-inflammatory drugs (NSAID's) (Williamson 2003:107).

---

342 Severe pain in the urethra, associated with an intense desire to pass urine (Martin 2002:659).

Chamomile *Chamaemelum nobile* L.

Latin - Leucanthemum, Eranthemis, Chamaemelon, Melanthion

English - German chamomile

The roots, flowers and leaves have warming and thinning properties. It induces menstruation when it is used in a sitzbath, as well as abortion. It draws down kidney stones and is used as a diuretic. It is given to drink for inflations and for intestinal obstructions, it relieves jaundice and is used to treat patients with liver disease. When chewed, it treats thrush and it cures lachrymal fistulas. (Diosc. 3.137.2). The oil cures intermittent fevers (Diosc. 3.137.3).

Pliny only prescribes chamomile as a veterinary medicine (Plin. *H.N.* 22.157).

- Modern description:

Chamomile is seen as a mild sedative and it is used as a soothing and analgesic application in toothache, earache and neuralgia (Williamson 2003:109, 110). Through its antispasmodic effects on smooth muscles (Ross 2001:296) it soothes colic (Holleman 1998:230) and the essential oil as well as a hot water extract of the flower, gently **sedates** (Ross 2001:294) the central nervous system and eases the impact of stress since it is seen as a nervine relaxant (Hoffmann 2003:518). A 30% ethanol extract of the flower has a positive effect when it is used as local Anaesthesia (Ross 2001:295). The essential oil taken orally, and the flavonoid fraction of the dried flower have anti-inflammatory effects (Ross 2001:292). Matricin, the precursor to chamazulene, as well as the sesquiterpene bisabolol compounds and flavonoids are reported for its anti-inflammatory effect (Newall 1996:69).

Analysis of its constituents reveals the presence of a volatile oil, containing the active ingredients azulene, chamazulene and a range of sesquiterpene (α-bisabolol), although the essential oil contains only 0.4 - 2.4% of the active constituents. Compounds of the sesquiterpene bisabolol are also important biologically active ingredients (Wallace 1998:90), but the oil consists mainly of the aliphatic ester, n-butyl angelate (Gillespie 1998:271).

The flavonoid apigenin is sedative and it is mainly the flowers of the herbs that is used (Van Wyk *et al.* 2004:200). The azulenes and bisabolol are anti-inflammatory

and the valerianic acid together with the cyanogenic glycosides are sedative (Mills 1991:449).

Cinnamon *Cinnamomum verum* L.

Afrikaans – Kaneel

All cinnamons have warming, diuretic, emollient and digestive properties. It also induces menstruation and labour. They are suitable antidotes for venoms and poisons. It also removes birthmarks and freckles. They are also helpful for coughs, head colds, edemata, kidney diseases and difficult urination (Diosc. 1.14.4).

Pliny writes that a double dose of savin[343] is equal to a single dose of cinnamon. He claims that it heals corroding sores and one application cleanses ulcers. As a pessary it acts as abortifacient and in combination with honey, it is used as an ointment for erisypelas and carbuncles. In wine it cures jaundice (Plin. *H.N.* 24.102).

- Modern description:

One of the essential oils found in the bark of cinnamon is myristicin. It has psychotropic properties, it induces sanity but also relaxes the body (Hoffmann 2003:94) since it is classified as a mild stimulant (Holleman 1998:233).

The essential oil, cinnamaldehyde, is found in the bark and antispasmodic activity is attributed to it (Van Wyk *et al.* 2004:105). Oil of Cinnamon is used in folk medicine for stomach cramps and diarrhoea and is still used (Wallace 1998:102). Cinnamon bark has analgesic and anti-inflammatory properties and the cinnamon leaf oil is anaesthetic, due to the eugenol content (Williamson 2003:121; Newall 1996:76). The bark and oil are widely used as flavouring agent (Williamson 2003:121).

Plant parts used is the inner peeled bark and the oil distilled from the bark and leaves (Williamson 2003:121).

Cinquefoil *Potentilla reptans* L.

English - Five-leaf-grass, Fivefinger

A decoction of the root can stop toothaches, control putrid humours in the mouth when used as a rinse, assuage hoarseness of the trachea when used as a gargle. It

---

343 *Juniperus sabina* L.

helps for diarrhoea and for dysentry and for those suffering in the joints and from hip ailments when drunk. It keeps shingles in check; it disperses scrofulous swellings in the glands, indurations, swellings, aneurisms, abscesses and erysipelas. It treats excrescences in the fingers, callous lumps and mange. The juice is good for ills of the liver and lung and for deadly poisons (Diosc. 4.42.2). The leaves are drunk for fits of intermittent fevers and treats fistulas and jaundice. The plant also helps those suffering form intestinal hernias and the stems stop bleeding (Diosc. 4.42.3).

- Modern description:

The active ingredient is thought to be tannins. The outer bark of the root has been used for diarrhoea and internal haemorrhages, as an antifever medication, and for the treatment of heartburn (Eisen 2003:02).

The powder also makes an astringent for mouth sores and is a very good gargle. Taken with honey, it relieves sore throats, coughs and fever.

The powdered root or bark of the root can be used, as well as the leaves.

The root contains many tannins and flavonoids based on quercetin so it can be used externally as an astringent lotion (Williamson 2003:178).

Coriander *Coriandrum sativum*

Afrikaans - Koljander

The coriander has a cooling property, it cures erysipelas and shingles (Diosc. 3.63), and Pliny adds that it heals wounds as well (Plin. *H.N.* 20.216). It treats pustules that are most painful at night, testicular inflammations, and carbuncles (Diosc. 3.63; Plin. *H.N.* 20.216), as well as panus[344] (Plin. *H.N.* 20.216). It dissolves scrofulous swellings of the glands and tumours (Diosc. 3.63). It expels intestinal worms (Diosc. 3.63; Plin. *H.N.* 20.217), but too much disturbs the thinking process (Diosc. 3.63).

Pliny writes that it acts as an antidote for the amphisbaena serpent (Plin. *H.N.* 20.216) and it is also useful to treat epilepsy (Plin. *H.N.* 26.113). The fresh plant reduces inflammation (Plin. *H.N.* 20.217).

For combinations of coriander with other ingredients, see Pliny (*H.N.* 20. 57, 81, 87, 102, 149; 23.16, 43).

- Modern description:

Coriander is reported to be antispasmodic and anti-inflammatory in animals. This is due to the coumarin content, including scopoletin and the phthlides such as neocnidilide (Williamson 2003:139). The essential oil is considered to be responsible for all the therapeutic actions of the fruit. It is also included in lotions to treat painful joints and rheumatism (Van Wyk *et al.* 2004:114). It is also used as a spice and for its fragrance (Williamson 2003:139).

Egyptian bean *Nelumbo nucifera* Gaert.

It has astringent and wholesome properties. The meal is suitable for people with colic and dysentry. The green part is good for earaches (Diosc. 2.106).

During personal communication Scarborough said that the weight of an Egyptian bean is about 4 grams (Scarborough 2008).

- Modern description:

The seed contains several medically active constituents, including alkaloids and flavonoids (PFAF 2008). Alkaloids present are nuciferine, neferine, lotusine, isoliensinine, quercitin, isoquercitrin and flavinoids. The oils are myristic, palmatic and oleic acids (Gupta 2008). Betulinic acid, a triterpene isolated from the plant demonstrated significant anti-inflammatory activity when tested in carrageenin and 5-hydroxytryptamine induced paw edema. The activity was comparable to betamethasone and phenylbutazone. The methanolic acid in the rhizome exerts an antipyretic effect (Mukherjee *et al.* 1996:275).

The seed is hypotensive, sedative and a vasodilator, as well as lowering the cholesterol levels and relaxing the smooth muscle of the uterus. It is used in the treatment of poor digestion, enteritis, chronic diarrhoea, spermatorrhoea, leukorrhoea, insomnia and palpitations. The plumule and radicle are used to treat thirst in high febrile disease, hypertension, insomnia and restlessness. The root is tonic. The root starch is used in the treatment of diarrhoea, dysentery etc. A paste is applied to ringworm and other skin ailments. It is also taken internally in the treatment of haemorrhages, excessive menstruation and nosebleeds. The root nodes are used in the treatment of nasal bleeding, haemoptysis, haematuria and functional bleeding of the uterus. The

---

[344] A superficial abscess of a hair follicle (Jones 1951:124).

plant has a folk history in the treatment of cancer. Modern research has isolated certain compounds from the plant that show anticancer activity (PFAF 2008).

Elaterium *Ecballium elaterium* Rich.

English - Squirting cucumber

The juice of the leaves is suitable to instill for earaches and the root disperses all old indurations, it breaks up tumours and it is beneficial to gout. Its decoctions are both a clyster for hip ailments and a rinse for toothaches (Diosc. 4.150.1). Ground up dry, it cleanses dull white leprosies, lichen-like eruptions and removes dark scars and facial blemishes. The juice of its roots purges phlegm and bile (Diosc. 4.150.2) as a laxative and emetic (Diosc. 4.150.6). Elaterium induces menstruation, acts as an abortifacient, purges jaundice and relieves chronic headaches and painful throats (Diosc. 4.150.7).

- Modern description:

The drug is soluble in alcohol, but insoluble in water and ether. The British pharmacopeia directs that the drug is to contain from 20 to 25% of the active principle elaterinum or elaterin. A resin in the natural product aids its action. A powerful hydragogue cathartic, and in large doses excites nausea and vomiting. If administered too frequently it operates with great violence on both the stomach and bowels producing inflammation and possibly fatal results. It also increases the flow of urine (micturition), and is of some use in the treatment of dropsy, especially when oedema is due to disease of the kidney. It also acts as a **sleep inducer** (Grieve 1931:241).

Figs *Ficus carica* L.

Afrikaans – Vy

Ngwaketse – Moomelantsweng

Sotho – Umkhiwane

Tlokwa – Mhawa

Figs causes diarrhoea, but clear chest conditions, old coughs and chronic conditions of the lungs (Diosc. 1.128.1), but Pliny says that it can also be used as a purge (Plin. *H.N.* 20.52).

The decoction is a serviceable gargle for inflammations of the trachea and tonsils (Diosc. 1.128.2; Plin. *H.N.* 22.120) and is used as a clyster for colic (Diosc. 1.128.2; Plin. *H.N.* 23.123).

Plastered on, it dissipates indurations and tumours of the parotid glands (Diosc. 1.128.2; Plin. *H.N.* 23.117, 118).

It softens small abscesses (Diosc. 1.128.2), and when boiled in wine, it helps people who suffer from edemata (Diosc. 1.128.2).

It treats chilblains and ringing and itching of the ears (Diosc. 1.128.3).

The milky substance relaxes the uterus and induces menstruation (Diosc. 1.128.3; Plin. *H.N.* 23.117).

In a poultice it is useful for gout (Diosc. 1.128.3; Plin. *H.N.* 23.117; 28.126).

It clears leprosy and lichen-like eruptions of the skin, freckles and dull white leprosy (Diosc. 1.128.3).

It helps those stung by scorpions and bitten by dogs and it helps for toothaches and removes warts (Diosc. 1.128.4).

For more indications of the fig, see Plin. (*H.N.* 20. 127, 129, 136, 178, 180, 237, 238, 250. 22. 103, 157. 23.25, 64, 80, 117-130, 149. 24.16, 30. 26. 21, 23, 29, 63, 75, 76, 93, 159. 27. 51. 38.126, 186. 29.102, 106, 20. 30.32).

- Modern description:

The chief constituent of figs is dextrose (about 50%). Figs are used for their mild laxative action, and are employed in the preparation of laxative confections and syrups, usually with senna and carminatives. It is considered that the laxative property resides in the saccharine juice of the fresh fruit and in the dried fruit is probably due to the indigestible seeds and skin (Grieve 1931:312).

Since ancient times the latex of the plant has generally been credited for its antihelmintic action. The proteolytic enzyme ficin digests ascaris (Watt 1962:774).

The triterpenes (oleanolic acid and lupeol) make it possible to use the fig as an emollient and demulcent (Williamson 2003:175).

Galbanum *Ferula galbaniflua* Boiss & Buhse

It has warming, burning, drawing and dispersive properties. It induces labour and menstruation and when plastered on the skin, it removes birthmarks. It is also drunk for a persistent cough, dyspnea, asthma, ruptures and spasms (Diosc. 3.83.1; Plin. *H.N.* 24.21). It is used as abortifacient, it counteracts arrow poisoning and is applied for both pain in the sides and for abscesses (Plin. *H.N.* 24.21). When smelled, it revives epileptics, those who suffer of uterine suffocation and dizziness. It stops toothache and relieves difficult urination (Diosc. 3.83.2).

Hippocrates employed it in medicine, and Pliny (*H.N.* 24.13) ascribes to it extraordinary curative powers, concluding his account of it with the assertion that "the very touch of it mixed with oil of spondylium is sufficient to kill a serpent." Pliny also writes that galbanum helps for sciatica, toothache and knotty lumps in the joints (Plin. *H.N.* 24.21). For further indications of galbanum, see Plin. *H.N.* 24.21-22.

- Modern description:

Galbanum contains about 8% of terpene; about 65% of a resin which contains sulphur; about 20% of gum; and a very small quantity of the colourless crystalline substance umbelliferone. The drug is occasionally given in modern medicine, in doses of from five to fifteen grains. It has the actions common to substances containing a resin and a volatile oil. Galbanum is used as a stimulant and expectorant in chronic bronchitis. It is also an antispasmodic. In pill form it is specially good, in some forms of hysteria, and used externally as a plaster for **inflammatory** swellings (Grieve 1931:340).

The gum resin is used as carminative, stimulant and expectorant. Recently it has been shown to alleviate morphine withdrawal syndrome, which is induced by naloxone (Williamson 2003:185).

Garlic *Allium sativum* L.

Afrikaans - Knoffel

English - Stinking rose, Treacle, Nectar of the gods, Camphor of the poor man's treacle

Swahili - Kitunguusumu

According to Pliny, garlic induces sleep (Plin. *H.N.* 20.57). Other properties of garlic: it is sharp, warm, it tends to relieve flatulence; it upsets the bowel and dries the stomach (Diosc. 2.152.1). It expels flat intestinal worms, it is diuretic and for those who bleed easily. A plaster is made for those who were bitten by a dog, viper or snake (Plin. *H.N.* 20.50). It clears the bronchi and it assuages chronic cough (Diosc. 2.152.2). It also treats black eye, bald spots and pustules. It removes birthmarks, lichen-like eruptions, scurf, dandruff and leprosies. It relieves toothache and a sitzbath induces menstruation and the excretion of the afterbirth. It is also useful for persons with edemata (Diosc. 2.152.3). Pliny adds that it is good for bruises on the body (Plin. *H.N.* 20.51), toothache (Plin. *H.N.* 20.53) and sprains and ruptures (Plin. *H.N.* 20.55). It also relieves pain in the spleen (Plin. *H.N.* 28.200). More indications are discussed in Plin. *H.N.* 20.50, 76.

- Modern description:

Garlic contains approximately 1.3% allicin (Jungnickel 1998:180) and it is an organosulphur compound which inhibits lipid peroxidation by the scavenging free radical metabolites during acetoaminophen toxicity (Hamilton *et al.* 1998:57). Garlic should only be used for patients with mild high blood pressure (Miller 1998:125) and it modifies plasma lipoprotein, inhibits platelet aggregation; it also enhances fibrinolycis (Jungnickel 1998:174). It can be categorised as stabilizing agent, choleretic and sulphur source (Hamilton *et al.* 1998:38).

Side effects of garlic: allergic contact dermatitis, nausea, diaphoresis, lightheadedness, burning sensation of the G.I. tract, vomiting, diarrhoea, metorrhagia, menorrhagia and spinal epidural hematoma (Miller *et al.* 1998:145).

It has wonderful cardiac protective properties and the allyl sulphides have antibacterial, antiviral and antifungal activity (Williamson 2003:187). The juice is also used to kill mosquito larvae spread on the surfaces of small, standing puddles of water (Iwu 1993:113).

Hemp *Cannabis sativa* L.

English - Marihuana, Indian hemp, Hashish, Ganja

Afrikaans – Dagga, Djamba, Intsangu

Sotho – Matakwane, Matekwane, Matokwane, Mmoana

Swati – Isangu

Xhosa – Umya

Zulu – Nsangu

The ancients only used hemp for braiding very strong ropes (Diosc. 3.148).

Pliny knew the medicinal properties of hemp. He writes that when the root is boiled in water, it eases cramped joints, gout and similar violent pains. It is also applied to burns (Plin. *H.N.* 20.259). Other indications are discussed in Plin. *H.N.* 20.259.

- Modern description:

The female flowers and associated leaves are known as marijuana or *Cannabis indicae herba* while the resin of the female plants is called hashish and the seeds are traditionally used in Chinese medicine (the *huo ma ren*) (Van Wyk *et al.* 3004:77). The plant name cannabis is from Greek κάνναβις (*kánnabis*).

The main psychoactive chemical compound is Δ^9-tetrahydrocannabinol (THC), but the plant is known to contain about sixty cannabinoids (which have little pharmacological action) (Watt 1962:765). Laevorotatory THC is the most active and has **anesthetic, sedative**, anti-nausea, anti-inflammatory and hypotensive (lowering blood pressure) properties, and is used to treat many **forms of pain**, insomnia, nausea, asthma, migraine headaches, rheumatism, glaucoma and depression (Van Wyk *et al.* 2004:77). It is very often used as a recreational drug and it induces a feeling of euphoria and intoxication, and may cause hallucinations. Hemp is believed to be the only plant that contains THC, a powerful psychoactive compound (Christman 2005:2).

Sotho women smoke cannabis to stupefy themselves during childbirth and the Hottentot not only used it as a snakebite remedy, but also as an intoxicant (Watt 1962:762).

Cannabinoids are the main constituents. TCH-acid decarboxylate is the active form when it is smoked. The constituents vary widely because it depends on the climate and type of soil. The alkaloids present are cannabisativine, muscarine and trigonelline (Williamson 2003:287).

Hemp is known for its analgesic, anti-inflammatory, hypnotic, sedative, cataleptic and hallucinogenic properties. The enzymes cyclooxygenase, lipoxygenase and phospholipase A_2 interact with the cannabinoids to induce sleep (Williamson 2003:287).

Hyssop *Hyssopus officinalis* L.

The hyssop has a warming property. It clears inflammation of the lungs, asthmatics, chronic coughs (Plin. *H.N.* 23.122; Plin. *H.N.* 26.29), catarrh and orthopnea (Diosc. 3.25.1), as well as pain in the sides (Plin. *H.N.* 26.31). It kills intestinal worms and expels thick masses down the abdomen (Diosc. 3.25.1; Plin. *H.N.* 26.54). It is also used as a plaster for the spleen, for edemata and for inflammations of the kidneys (Diosc. 3.25.2; Plin. *H.N.* 22.52). It disperses black eye and assuages toothaches and sore throats. Its vapour stops inflations around the ears (Diosc. 3.25.2). Pliny also writes that bruises disappear under the application of hyssop (Plin. *H.N.* 25.175), as well as any inflammation (Plin. *H.N.* 26.127). Hyssop also calms patients who are hysteric (Plin. *H.N.* 26.161).

More references to hyssop can be found in the writings of Pliny (*H.N.* 21.178, 188. 22.33, 52. 23.55, 122. 25.136 26.23, 29, 31, 32, 34, 40, 41, 76, 114, 124, 144, 160, 164. 28.246).

- Modern description:

The essential oil contains the ketone pino-camphone which in high doses can cause convulsions (Van Wyk *et al.* 2004:177). Hyssop also has medicinal properties which includes expectorant, carminative, it relaxes peripheral blood vessels, promotes sweating and it has **anti-inflammatory**, anti-catarrhal and antispasmodic effects. Its active constituents are flavonoids and tannins and a bitter substance (marrubin). A strong tea made from the leaves and flowering tops is used in lung, nose and throat congestion and catarrhal complaints, and externally it can be applied to bruises and to reduce the swelling. An essential oil made from hyssop increases alertness and is

a gently relaxing nerve tonic suitable for treating nervous exhaustion, overwork, anxiety and depression (Grieve 1931:427).

Inducing sleep is one of the medicinal uses of hyssop and the ursolic acid has an anti-inflammatory effect (Williamson 2003:230).

Laurel berry *Laurus nobilis* L.

English - Bay, Sweet bay, Bay laurel

Afrikaans - Lourier

Italian - Alauro, Alloro, Lauriello

French - Laurier D'apollon

German - Lorbeerfrucht

When they mixed laurel berries with analgesics and with other ointments that warm, it was useful for paralysis, convulsions, sciatica, bruises, headache (Plin. *H.N.* 23.152) and catarrh (Plin. *H.N.* 23.86). The laurel oil was used to make anodynes and to treat pains in the side, bowels and intestines (Plin. *H.N.* 23.157). Decoctions in sitzbaths are well suited for ailments around the bladder and uterus and the leaves are mildly astringent and it assuages all inflammations (Diosc. 1.78.1). The berries are efficacious for tuberculosis, orthopnea and rheums in the chest. They are drunk for scorpion bites and they clear dullwhite leprosies. The juice relieves earache, ringing in the ears and hardness of hearing (Diosc. 1.78.2; Plin. *H.N.* 20.137, 23.154). The bark breaks kidney stones, acts as abortifacients and helps those who suffer from liver disease (Diosc. 1.78.2). It is also used to calm people who suffer from phrenitis[345] (Plin. *H.N.* 20.138). Other properties of the laurel are described in Pliny (*H.N.* 20. 142. 23.86, 152-158).

- Modern description:

The berries contain both fixed and volatile oils, the former, known as Oil of Bays, includes laurostearine, the ether of lauric acid. Laurin can be extracted by alcohol. Oil of Bays is used externally for sprains, bruises, etc., and sometimes dropped into the ears to **relieve pain**.

---

345 According to Jones (1951:8), it is also known as pernicious malaria, a form of it which is characterised by raving and delirium.

The **analgesic and anti-inflammatory effect** of the essential oil is comparable to reference analgesics and non-steroid anti-inflammatory drugs: morphine and piroxicam (Sayyah *et al.* 2003). Leaves, berries and oil have excitant and narcotic properties. An extract of the dried leaves inhibits edema and prevents inflammation (Ross 2001:264) and has antipyretic activity (Ross 2001:265). The leaves have a volatile oil containing cineole as the major component. This is used as external application for rheumatism (Williamson 2003:259).

The leaves are also regarded as a diaphoretic and in large doses as an emetic. The leaves and fruit are employed in hysteria, amenorrhoea and flatulent colic. The berries have been used to promote abortion. The leaves were formerly infused and taken as tea, and the powder or infusion of the berries were taken to remove obstructions, to create appetite, or as an emmenagogue (Grieve 1931:464).

The plant is used in South Africa as a diuretic in gonorrhea and as a snakebite remedy (Watt 1962:529).

The leaves are used for culinary spice and flavouring (Williamson 2003:259).

Lettuce *Lactuca scariola* L.

English - Lettuce opium. The dried latex is also called Lactucarium. Also garden/salad lettuce

Afrikaans – Kropslaai

According to the following, Pliny prescribed lettuce for different pains and for the sleeping effect (Plin. *H.N.* 20.64, 67). It helped for toothache (Plin. *H.N.* 20.58) and the juice was seen as the same as those of poppy (Plin. *H.N.* 20.61).

The cultivated lettuce is somewhat cooling and **soporific**. It softens the bowel and induces lactation. The seed is good for those who frequently emit their semen in their sleep and it is a deterrent to sexual intercourse (Diosc 2.136.1).

Theophrastus writes that it purges away dropsy and takes away the dimness of sight and removes ulcers on the eye (Theop. *H.P.* 7.6.2).

- Modern description:

Wild lettuce is stated to possess **narcotic properties (sedative, anodyne and hypnotic)** since it has an alkaloid content of hyoscyamine and N-methyl-β-

phenethylamine (Newall *et al.* 1996:266). It is important to use the correct dosage, since too high or too low doses can lead to insomnia (Gabel 1998:223), (Holleman 1998:230). The tropane alkaloid hyoscyamine and nanogram concentrations of morphine are found in lettuce, which explains why it has sedative, hypnotic and analgesic properties (Williamson 2003:264). Lactucin and its derivatives, as well as lactuside A are the most active ingredients (Williamson 2003:264).

Long pepper *Piper officinarum* DC.

Afrikaans – Peper

French – Poivre

German – Pfeffer

Italian – Pepe

Spanish – Pimiento

According to Dioscorides, the long pepper is an analgesic (Diosc. 2.159.3). Pliny describes an ointment and oral medication which is made of pepper in combination with other ingredients that act as anodyne (Plin. *H.N.* 29.55) and it calms hysterical patients (Plin. *H.N.* 24.164). Pepper is also used to prevent inflammation in wounds (Plin. *H.N.* 24.179), it relieves sciatica (Plin. *H.N.* 30.71) and toothache (Plin. *H.N.* 31.117).

When it is unripe, it is more suitable to use in antidotes and for medications against poisonous bites and those of wild animals (Diosc. 2.159.3; Plin. *H.N.* 25.100, 29.88), and it cures recurring shivering fits (Diosc. 2.159.3).

In general, it can warm, promotes digestion (Diosc. 2.159.3; Plin. *H.N.* 27.48), the production of urine (Diosc. 2.159.3; Plin. *H.N.* 24.100) and perspiration. (Diosc. 2.159.3). It acts as abortifacient and after sexual contact, it causes barrenness (Diosc. 2.159.3). Pliny adds that pepper expels the afterbirth (Plin. *H.N.* 26.154). It is fit for all conditions associated with the chest and asthma (Plin. *H.N.* 22.33, 23.150, 27.130), sore throats and colic (Diosc. 2.159.3).

It purges away phlegm; it stimulates the appetite and helps digestion (Diosc. 2.159.3). Pepper also dissipates scrofulous swellings of the glands and clears away dullwhite leprosies (Diosc. 2.159.4). The root stimulates salivation and reduces the

size of the spleen when it is plastered on in combination with vinegar (Diosc. 2.159.4).

For more indications, see Pliny (*H.N.* 20.87, 22.155, 23.150, 26.117; 27.42, 28.119, 120 29.49, 30.53, 71 31.117, 32.101).

- Modern description:

Although long pepper is a close relative of the black pepper plant, it has a generally hotter taste. Piperine (a pseudoalkaloid), which is identical in structure to morphine, also contains a volatile oil and a resin called chavicin. The pseudoalkaloids are 10 – 15% pungent amino acids (Van Wyk *et al.* 2004:244).

Its medicinal activities depend mainly on its pungent resin and volatile oil which does not have such an acrid taste as the peppercorn. Piperine should not be combined with astringents, as it renders them inert. Long pepper is aromatic, a stimulant and a carminative. The essential oil (up to 3.5%) is topically used to treat **toothache and rheumatic pains** (Van Wyk *et al.* 2004:244). Its action as a stimulant is especially evident on the mucous membrane of the rectum, and is good for constipation and the urinary organs. Externally it is a rubifacient, useful in relaxed conditions of the rectum when prolapsed; sometimes used in place of cubebs for gonorrhea; given in combination with aperients to facilitate their action, and to prevent griping and diarrhoea. As a gargle it is valued for relaxed uvula, paralysis of the tongue. On account of its stimulant action it aids digestion and is especially useful in atonic dyspepsia. It will also ease flatulence and nausea. It has also been used in vertigo, paralytic and arthritic disorders. It has also been advised in cholera, scarlatina, and in solution for a wash for *tinea capititis*. (Grieve 1931:627).

It has anti-inflammatory effects due to the isolated piperine constituent (Williamson 2003:336).

Marjoram *Majorana hortensis* Moench

It is mixed both with analgesics and with emollients that are used for warming (Diosc. 3.39.2).

It is highly aromatic, it warms and when it is drunk, its decoction is good for people with incipient edemata, for difficult micturition, and for those who suffer from colic (Diosc. 3.39.1; Plin. *H.N.* 20.175). The dry leaves applied as a plaster with honey

remove black eye and draw down the menses when used as a pessary; they are plastered on with salt and vinegar for the sting of the scorpion, for sprains they are applied after being compounded with a cerate, they are similarly compounded with a cerate for swellings, and they are plastered on with very fine meal of barley groats for inflammations of the eyes (Diosc. 3.39.2). Celsus used it as a discutient (Cels. 2.10).

- Modern description:

Its properties are stimulant, carminative, diaphoretic and mildly tonic and it is a useful emmenagogue. It is so acrid that it has been employed not only as a rubefacient, and often as a liniment, but also used as a caustic. A few drops, put on cotton-wool and placed in the hollow of an aching tooth frequently relieve the **pain**. Measles, spasms, colic, and relief from pain in dyspeptic complaints are some of the usages.

Externally, the dried leaves and tops may be applied in bags as a hot fomentation to **painful swellings** and rheumatism, as well as for colic. An infusion made from the fresh plant will relieve nervous head**ache**, due to the camphoraceous principle in the oil (Grieve 1931:520).

It is often used as a flavouring agent (Williamson 2003:289, 321).

Mustard *Sinapis alba* L.

Afrikaans – Wit / Swartmosterd

It is capable of warming, attenuating, drawing, and of purging away phlegm when chewed. Its juice is a suitable rinse for tonsillitis and for chronic callous roughness of the trachea (Diosc. 2.154.1). It causes sneezing, it resuscitates epileptics and uterine suffocation and it is plastered on the shaven head of people who suffer from lethargic fever. It is suitable for hip diseases, afflictions of the spleen, and in general, for all chronic pains, whenever we wish to transfer something from deep inside the body to the surface in order to causes a counter-irritation (Diosc. 2.154.2). It is smeared on with vinegar for leprosies and for wild lichen-like eruptions of the skin, as well as scabies (Plin. *H.N.* 20.129). It is also drunk for fits of intermittent fever, it is mixed advantageously with absorbing plasters and with itch salves, and it is beneficial with fig for hardness of hearing and for ringing in the ears when it is ground fine and instilled into the ear (Diosc. 2.154.3; Plin. *H.N.* 20.129). Combined with honey and

smeared on, its juice is suitable for dim-sightedness and for rough eyelids" (Diosc. 2.154.3).

It relieves tooth-ache (Plin *H.N.* 20.236) and pains in the side (Plin. *H.N.* 20.238). More indications are discussed in Diosc. 2.154 and Plin *H.N.* 20. 236-241, 21.71, 155, 28.165, 219, 220, 29.108.

- Modern description:

The plant has emmolient, **sedative** and even **narcotic** properties (Watt 1962:336). Undiluted it is regarded as a very toxic essential oil since it causes ulcers when it is applied for too long (Beckwith 1998:109).

The oil has been used as a rubifacient and it is usually used medicinally as an external application for rheumatic pain (Williamson 2003:307).

Myrrh *Commiphora myrrha* Engl.

Sleep is induced by myrrh (Plin. *H.N.* 30.140) and Dioscorides (Diosc. 1.64.3) also ascribes a soporific effect to myrrh. Dioscorides also writes that it has heating, agglutinative, desiccative, and astringent properties. It also draws rapidly down both the menses and embryos/fetuses (Diosc. 1.64.3; Plin. *H.N.* 24.22, 26.154, 26.159). It is taken as a little pill the size of a bean for chronic coughs, orthopnea, pains of the side and chest (See also Plin. *H.N.* 27.130), diarrhoea and dysentry (Diosc. 1.64.3). It is also good for shivering fits, it mends roughness of the trachea and hoarseness of voice, and it kills intestinal worms. It is used as a mouthwash (See also Plin. *H.N.* 25.175), mends head-wounds and heals bruised ears and exposed bones. In combination with opium poppy, castor and horned poppy juice, it heals pussy and inflamed ears (Diosc. 1.64.4). It heals facial eruptions, lichen-like skin eruptions (See also Plin. *H.N.* 24.86) and also soothes chronic catarrhs. It fills out eyesores (See also Plin. *H.N.* 21.131) and cleanses both leucomas and the elements that cast a shadow over the pupils of the eyes (Diosc. 1.64.5). It relieves toothache, as well as eye-fluxes (Plin. *H.N.* 24.179).

It was used internally as a diuretic (Plin. *H.N.* 25.41;Cels .3.21.7), and the seeds in an antidote (Cels 5.23.3.B; Plin. *H.N.* 24.22); externally as an erodent, suppurative, wound cleaner and emollient (Cels. 5.2; 5.6.1), also in poultices (Cels. 5.18.3;

5.18.7.B), and as a remedy for neuralgia (Cels. 5.25.1), and in an eye salve (Cels. 6.30).

For other effects, see Pliny (*H.N.* 23. 136, 139. 24.86. 26.109. 28.174, 175, 179, 214, 245. 29.41, 46, 137. 30.24, 87, 88, 93, 105, 116, 140, 145).

- Modern description:

Myrrh consists of complex polysaccharides, triterpenoids, triterpene acids and an essential volatile oil. The oil is thick, pale yellow, and contains myrrholic acid and is rich in sesquiterpenene (*β*-elemen, *α*-elemen) and furanosesquiterpenes of the elements euedesmen, guaien and germacren types. Furanoeudesma-1,3-diene is the main compound (Van Wyk *et al.* 2004:111).

The oleo-gum resin of myrrh is mainly used for its analgesic effects (Williamson 2003:309) and as an antiseptic, antifungal (Hoffmann 2003:456) and **anti-inflammatory** for the topical treatment of mouth and throat infections (gingivitis, tonsillitis and mouth ulcers) (Van Wyk *et al.* 2004:111). Furaneudesma-1,3-diene interacts with opioid receptors and shows structural similarites with morphiceptin and other opioid agonists (Williamson 2003:309) .

Its medical actions are astringent and it heals wounds quickly. It is a tonic in dyspepsia and a stimulant to the mucous tissues. It is a direct emmenagogue, it has antidiabetic effects (Miller 1998:125) and is an antimicrobial (Hoffmann 2003:452) and expectorant in the absence of feverish symptoms and disorders of the respiratory tract (Van Wyk *et al.* 2004:364), as well as mucosal inflammation (Van Wyk *et al.* 2004:366). It is not used in South Africa as a medicinal plant (Watt 1962:152).

Nettle *Urtica dioica* L.

All nettles are poisonous, and only a light touch causes ithcing and blisters (Plin. *H.N.* 21.93). It is used as an antidote for henbane, snakebites and scorpion stings (Plin. *H.N.* 22.31), as well as dogbites (Plin. *H.N.* 22.32). It stops nose bleeding and heals carcinoma and foul ulcers, sprains and abscesses. It also relieves suffocation of the uterus (Plin. *H.N.* 22.32). It induces vomiting and relieves fatigue, uterine affections and flatulence, as well as asthma and pains in the sides (Plin. *H.N.* 22.33).

It is an application for the spleen and relieves constipation, and it expells intestinal worms. It relieves pains in the joints and gout (Plin. *H.N.* 22.34).

For other indications, see Diosc. 4.158 and Plin. *H.N.* 22.35-38, 32.102.

- Modern description:

The dried leaves are used both internally and externally for mild cases of acne vulgaris, nose-bleeding (Iwu 1993:68) and seborrhea of the scalp. It is also seen as a treatment for the irrigation of the urinary tract (Gillepsie 1998:269) and it has antidiabetic effects (Miller 1998:125) as well as effects on the blood pressure (Miller 1998:154). The herb relieves also rheumatic **pains** when it is drunk as a tea (Beckwith 1998:109) because the leaf extracts inhibit the pro-inflammatory transcription factor NF-kappaB (Williamson 2003:313). This also alleviates the pain due to osteoarthritis (Williamson 2003:313). Nettle also has **sedative** properties (Holleman 1998:230).

Olive *Olea europaea* L.

Afrikaans - Olyf

Olives relieve erysipelas, shingles, pustules that are most painful at night, carbuncles, spreading ulcers (See also Plin. *H.N.* 23.73), whitlow, and it can form a line of demarcation around scabs and burns (Diosc. 1.105.1; Plin. *H.N.* 23.73). They clean filthy sores, dissipate swellings of the glands and inflammations, and glue on skin detached from the heAD It also treats both mouth sores and thrush (Diosc. 1.105.1). The juice control heamorrhage and leucorrhea and the leaves control defects in the eyes inside the cornea and pustules. They heal sores and old rheums. They help for erosions of the eyelids and are good for ears that discharge and that suppurate (Diosc. 1.105.2). The leaves are also suitable for bowel ailments (Diosc. 1.105.3, Plin. *H.N.* 23.73). The liquid treats dandruff, mange and lichen-like eruptions. The inside of olive-pits drives out nails afflicted by psoriasis. It cleanses dirty sores and is used as a mouthwash, it reduces swollen gums and strengthens loose teeth (Diosc. 1.105.4; Plin. *H.N.* 23.73). Roasted olives halt spreading ulcers and cause carbuncles to break away (Diosc. 1.105.5).

- Modern description:

A naturally occurring chemical found in extra-virgin olive oils is a non-steroidal anti-inflammatory agent, named oleocanthal. The compound inhibits activity of cyclooxygenase (COX) enzymes, a pharmacological action shared by ibuprofen (Stein 2005:4). The unsaturated fatty acids are anti-inflammatory (Williamson 2003:318). The anti-hypertensive effects, as well as the spasmolytic actions on the smooth muscles are due to the presence of oleuropein in the leaves. The extract of the leaves also dilates the bronchi and improves blood circulation (Iwu 1993:217).

The oil is nutritive and an emollient, used in liniments and embrocations (Williamson 2003:318).

Pellitory *Anacyclus pyrethrum* DC = *Anthemis pyrethrum* L.

The root of pellitory draws phlegm and is extremely hot. This is why it is also used as a mouthwash and for toothache. It causes perspiration and is effective against chronic shiverings (Diosc. 3.73).

According to Dioscorides, there is a species of pellitory called *Parietaria officinalis* L. This one's leaves have cooling and astringent properties; the reason why it treats erysipelas, callous lumps, fiery inflammations and incipient swellings (Diosc. 4.85.1). The juice also relieves erysipelas, shingles and gout. It relieves chronic coughs, inflamed tonsils and earaches (Diosc. 4.85.2).

- Modern description:

Analysis has shown a brown, resinous, acrid substance containing two oils *pelletonin* and tannin. An alkaloid, pyrethrine, yielding pyrethric acid, is stated to be the active principle (Grieve 1931:621).

Pellitory root is widely used because of its pungent efficacy in relieving **toothache** and in promoting a free flow of saliva. The British Pharmacopoeia directs that it can be used as a masticatory, and in the form of lozenges for its reflex action on the salivary glands in dryness of the mouth and throat. The tincture made from the dried root may be applied to relieve the aching of a decayed tooth, applied on cotton wool, or rubbed on the gums, and for this purpose may with advantage be mixed with camphorated chloroform. It forms an addition to many dentifrices (Grieve 1931:622).

A gargle of Pellitory infusion is prescribed for relaxed uvula and for partial paralysis of the tongue and lips. Relief from **rheumatic or neuralgic** affections of the head and face, or for palsy of the tongue can be obtained by chewing the root daily for several months. Being a rubefacient and local irritant, when sliced and applied to the skin, it induces heat, tingling and redness by the vasodilation of the cappilaries. The powdered root forms a good snuff to cure chronic catarrh of the head and nostrils and to clear the brain, by exciting a free flow of nasal mucous and tears (Grieve 1931:622).

The essential oil is constituted with eugenol and alkamides such as isobutylamide are found. The efficacy of the root extract was compared with Xylocaine® , a chemical local anesthetic and it exerts the same effect. Anti-inflammatory activity was also found, due to the presence of eugenol (Williamson 2003:331). The alkamides inhibit cyclo-oxygenase and lipoxygenase to produce the anti-inflammatory effect (Williamson 2003:331).

Pepper, Pepper tree, Peppercorns *Piper nigrum* L.

Swahili – Pilipili, Pilipili manga

The black pepper is sharper than white pepper, tastier and more aromatic, because it is ripe. It is more useful in dressings on wounds (Diosc. 2.159.2). For the general uses, see Long pepper.

- Modern description:

Piperine is the main ingredient, which is identical in structure to morphine. Its medicinal activities depend mainly on its pungent resin and volatile oil, which is colourless, turning yellow with age, with a strong odour, and not so acrid a taste as the peppercorn. Other alkaloids are piperidine, piperettine and chavicine (Watt 1962:847).

Piperine is known for its aromatic, stimulant and carminative effects and it is said to possess febrifuge properties. Its action as a stimulant is evident on the urinary organs and on the mucous membrane of the rectum, and is thus good for constipation. Recent medical studies have shown piperine to be very helpful in increasing the absorption of certain vitamins such as Selenium, Vitamin B and Beta-

Carotene. Piperine apparently has the ability to increase the body's natural thermogenic[346] activities. Externally it is a rubefacient and useful in relaxed conditions of the rectum when prolapsed. On account of its stimulant action it aids digestion and it is especially useful in atonic dyspepsia and torbid condition of the stomach. It will correct flatulence and nausea. The essential oil is used topically to treat **toothache** (Van Wyk *et al.* 2004:244), vertigo, paralytic and **arthritic** disorders (Grieve 1931:627). It is sometimes added to quinine when the stomach will not respond to quinine alone. It has also been advised in diarrhoea and cholera. It possesses also anti-helmintic effects when it is used as a wash for *tinea capititis*. Piperine should not be combined with astringents, as it renders them inert (Grieve 1931:627).

Peppercorns figure in remedies for constipation, diarrhoea, earache, gangrene, heart disease, hernia, hoarseness, indigestion, insect bites, insomnia, joint **pain**, liver problems, lung disease, oral abscesses, sunburn, tooth decay and **toothaches** (Turner 2004:171).

Plantain *Plantago major* L.

English – Broad leaf plantain, Rib grass, Ripple grass, Wild sago

Afrikaans – Groot weëbree, Platvoet, Weëblaar, Plataan

Zulu – Indlebe-ka-tekwane

The plantain leaves cool down gouty joints (Plin. *H.N.* 26.101, 30.76), and it is good for painful sinews and joints (Plin. *H.N.* 26.130), especially when someone falls from a height (Plin. *H.N.* 25.137). It has astringent and desiccative properties when applied on malignancies, elephantiasis and on running and foul sores (see also Plin. *H.N.* 24.176). The leaves of the plantain also control haemorrhages, spreading ulcers (see also Plin. *H.N.* 26.92, 26.141), carbuncles, shingles and pustules that are most painful at night. The leaves cicatrise both chronic and irregular sores and glue together hollows. They are beneficial for dog bites and scorpion stings (Plin. *H.N.* 25.122, 125), burns (see also Plin. *H.N.* 26.129), inflammations, tumours of the parotid glands, scrofulous swellings and lachrymal fistulas (see also Plin. *H.N.* 26.126). The boiled leaves are suitable for dysenteric and colic patients (see also Plin. *H.N.* 26.32, 26.44, 26.74). It is also good to give it to epileptics and asthmatics

346 Thermogenesis is the process of generating energy in the cell. Piperine increases thermogenesis and in

(Diosc. 2.126.2; Plin. *H.N.* 26.33). The juice of leaves stop spreading ulcers in the mouth, cures erysipelas and is beneficial for fistulous sores. It relieves earaches (see also Plin. *H.N.* 25.164), ophthalmia (see also Plin. *H.N.* 25.143) and is also good for bleeding gums (see also Plin. *H.N.* 25.174), coughing blood and for the tuberculars (see also Plin. *H.N.* 26.27). It is applied on wool as a pessary for uterine suffocation and uterine discharges (Diosc. 2.162.3; Plin. *H.N.* 26.153, 158). The seed stops diarrhoea and blood spitting. The boiled root stops toothaches (see also Plin. *H.N.* 25.165) and it is given together with the leaves for bladder and kidney ulcers (Diosc. 2.163.4; Plin. *H.N.* 26.78, 26.118).

More indications are found in Pliny (*H.N.* 22.144 26.21,38, 88, 90, 110, 113, 115, 118-122, 131, 136).

- Modern description:

Plantain leaves contain citric acid and yields the glucoside aucubin and the seed also contains aucubin as well as choline and organic acids (Watt 1962:849).

Plantain is used as refrigerant, diuretic, deobstruent and it has somewhat of an astringent effect. Plantain has sucessfully been used in **inflammation** of the skin (Scarborough 2008 adds that it is used in the USA as a wash for poison ivy rush), malignant ulcers and intermittent fever. Externally it is applied as a stimulant application to sores. Applied to a bleeding surface, the leaves are of some value in arresting haemorrhage.

The Zulu apply the fresh leaves whole or bruised into the mouth and ear or apply a decoction of the root as an enema to newborn babies to cleanse the intestinal tract. The Xhosa however, drink a decoction when they suffer from diarrhoea (Watt 1962:848). They also used the plantain leaf to heal sores when covered with it and women drink a decoction of the leave to enhance fertility and induce pregnancy (Watt 1962:850). Rubbed on parts of the body stung by insects, nettles, etc., or as an application to burns and scalds, the leaves will afford relief and will stop the bleeding of minor wounds (Grieve 1931:640).

---

turn creates a demand for nutrients necessary for metabolism (Encyclopedia Britanica 1999).

Extracts of the leaves and seeds have been shown to have anti-inflammatory and analgesic effects (Williamson 2003:348). Especially apigenin and baicalein are anti-inflammatory constituents (Williamson 2003:348).

Pomegranate *Punica granatum* LSJ

Afrikaans – Granaat, Granaatappel

Swahili - Mkoma manga

The roots of the pomegranate act as a soporific if taken in wine (Plin. *H.N.* 23.114). Pliny writes that the pomegranate rind relieves headache and pains in the eyes (Plin. *H.N.* 23.85), as well as sciatica, paralysis, convulsions (see also Plin. *H.N.* 32.112), bruises and catarrh (Plin. *H.N.* 23.86). The pomegranate is astringent (Diosc 1.110.1) and cures diarrhoea and fluid discharges from the stomach (Diosc. 1.110.2; Plin. *H.N.* 21.72, 23.106, 24.129). It helps those who spit blood and are suitable for sitzbaths for dysenteries and for women who suffer from fluxes (Plin. *H.N.* 28.102). The juice of the pips is useful for sores in the mouth, the genitalia and the seat (see also Plin. *H.N.* 22.103), for fleshy excrescences on the digits, for spreading ulcers, for earaches (see also Plin. *H.N.* 22.90, 23.85, 23.86, 23.157, 24.57, 28.136) and for afflictions in the nostrils. Its flowers are also astringent because it acts as a drying agent for bleeding wounds and for gluing the wound together. The decoction is a mouthwash for flaccid gums and loose and painful teeth (see also Plin. *H.N.* 23.107, 24.77, 28.182) and an adhesive plaster for intestinal hernias (Diosc. 1.110.2). The decoction of the roots ejects and destroys intestinal flatworms when drunk (Diosc. 1.110.3; Plin. *H.N.* 20.218, 23.85, 23.109).

Pliny gives more indications in *H.N.* 22.143, 23.106-114, 123, 32.117.

- Modern description:

The chief constituent of the bark (about 22%) is called punicotannic acid. It also contains gallic acid, mannite, and four alkaloids: pelletierine, methyl-pelletierine, pseudo-pelletierine, methyl-isopelletierine and isopelletierine (Watt 1962:876). Pelletierine tannate is a mixture of the tannates of the alkaloids obtained from the bark of the root and stem, and represents the taenicidal properties. The most abundant polyphenols are the hydrolysable tannins punicalagins, which have potent free-radical scavenging abilities (Mertens-Talcott *et al.* 2006:6). The pomegranate

has the potential to prevent and treat inflammation and cancer (Lansky *et al.* 2007:177).

The seeds are demulcent. The fruit contains boric acid and ascorbic acid (Watt 1962:876) and is a mild astringent and refrigerant in some fevers, and especially in biliousness, and the bark is used to remove tapeworm.

In South Africa the rind is used in diarrhoea, to relieve stomach ache, colitis and chronic dysentery (Watt 1962:876). It is used as an injection in leucorrhoea, as a gargle in sore throat in its early stages, and in powder for intermittent fevers (Grieve 1931:649). The juice has been found effective in reducing heart disease risk factors by inhibiting angiotensis-converting enzyme and to reduce systolic blood pressure (Aviram *et al.* 2001:2). It is also effective against osteoarthrits (Haqqi 2005:6). The bark and the rind of the fruit are also used (Williamson 2003:352).

Rose *Rosa sempervirens* L.

Afrikaans – Roos

It relieves diarrhoea when it is boiled in wine and drunk (Diosc. 1.94). Rose juice is used for the ears, sores in the mouth, the gums, as a gargle for the tonsils, for the stomach, uterus, rectal trouble, headache – when due to fever either by itself or with vinegar – to induce sleep or to dispel nausea (Plin. *H.N.* 21.120).

- Modern description:

The key compounds that contribute to the distinctive scent of rose oil are beta-damascenone, beta-damascone, beta-ionone and rose oxide (Leffingwell 1999:3).

Rose of the gallica family is a good source of Vitmain C in ointments and lotions. It is also an astringent and carminative. The flowers are mainly used for its flavour (Williamson 2003:378).

Rush *Scirpius* sp. L.

The Euripic (canal of ditch – LSJ) rush has **soporific** fruit. One must guard against drinking too much of it, for it is a powerful somnifacient (Diosc. 4.52.2). Its seed is said to **induce sleep**, but the dose must be kept small, or coma will result (Plin. *H.N.* 21.112).

For other indications besides its soporific effect, see (Plin. *H.N.* 21.117).

Saffron Crocus sativus L.

Afrikaans - saffraan

French – safran

German – Safran

Italian – zafferano

Spanish - azafrán

Saffron induces sleep and has a "gentle action on the head" (Plin. *H.N.* 21.138). It also relieves headache (Plin. *H.N.* 24.78) and gout (Plin. *H.N.* 28.219). Saffron has digestive, emollient, somewhat astringent and diuretic properties. It brings about a healthy complexion and counteracts nausea (Diosc 1.26.2). It is mixed advantageously with draughts for internal afflictions and with pessaries and poultices for the uterus and anus (See also Plin *H.N.* 23.8). It is an aphrodisiac, it soothes inflammations caused by erysipelas (See also Plin. *H.N.* 21.138) when applied as an ointment, and it is useful for inflammations of the ears. Even the root is diuretic (Diosc. 1.26.3). Pliny adds that in combination with myrrh, it relieves gout and it is used for inflammations of the eyes (Plin. *H.N.* 21.131, 21.137). Saffron relieves the suffocation of the womb, ulcerations and inflammations (See also Plin. *H.N.* 23.84) of the throat, chest, kidneys, liver, lungs and bladder, as well as coughing and pleurisy (Plin. *H.N.* 21.137). It is also known as a "stomatice" i.e. mouth medicine (Jones 1951:486, Pliny Vol. 6) which heals sores in the mouth, ears and nostrils (Plin. *H.N.* 23.8, 23.108). Saffron is also used to relieve stomach troubles and dysentry (Plin. *H.N.* 24.129). For more uses of saffron in combinations with other ingredients, see Pliny (*H.N.* 24.165, 166, 25.169, 27.103, 28.94, 248, 29.39, 120, 138, 30.126, 32.58).

According to Scarborough (2008) saffron was very expensive (Diosc. 1.26) in ancient times since 100 000 flowers were necessary to produce 1 kg of saffron. According to Diocletian's *Price Edict* (AD 301), saffron was the most expensive drug by far.

- Modern description:

Saffron is characterised by a bitter taste and an iodoform- or hay-like fragrance; these are caused by the chemicals picrocrocin and safranal. It contains mainly terpenes, terpene alcohol and esters. The carotenoid dye, crocin gives food a rich golden-yellow hue. Crocetin is a yellow pigment in the stigmas (plant parts used) that is derived from a linear diterpene, crocetin, which lowers the lipids in the blood (Van Wyk *et al.* 2004:116). Saffron has a long history as part of traditional healing; modern medicine has also discovered saffron as having **analgesic effects** (Van Wyk *et al.* 2004:116) as well as anticarcinogenic (cancer-suppressing) (Abdullaev 2002:4), anti-mutagenic (mutation-preventing), immunomodulating, and antioxidant-like properties (Assimopoulou *et al.* 2005:3) This drug may be teratogenic when it is used while pregnant (Hoffmann 2003:395) and 10 grams per day will cause abortion and uterine

bleeding (Van Wyk *et al.* 2004:116). It facilitates the oil to have the same effects of opium when it is used in combination with saffron (Scarborough 1995:14).

The flowers are used mainly for its colour and flavouring of food (Williamson 2003:383).

Sage *Salvia officinalis* L.

English - Red sage, Garden sage

The decoction of its leaves and branches when drunk has properties that set the urine and menstruation in motion, draw down embryos/fetuses, and help for strokes of the sting ray. It also darkens the hair, it is used for wounds, it staunches the blood, and it cleanses malignant sores. Used as a wash with wine, the decoction of its leaves and branches stops itching around the genitalia (Diosc. 3.33.2).

- Modern description:

Sage is a popular remedy against mucosal inflammation of the mouth and throat (Van Wyk *et al.* 2004:283) because rosmarinic acid and other components are anti-inflammatory (Williamson 2003:384). It is also used as an antispasmodic (Van Wyk *et al.* 2004:283). Sage is used for their blood-glucose effects and is thus beneficial for diabetes mellitus (Miller 1998:125) and it is used for its purported effects on blood pressure since it has hypotensive effects (Miller *et al.* 1998:154). It has long been reported to stop the production of breastmilk (Kincheloe 1998:293, 299). Sage has great **sedative properties** (Holleman 1998:230).

Sage is a popular culinary herb (Williamson 2003:384).

Spikenard *Nardostachys jatamansi* DC., *Patrinia scabiosifolia* Fisch.

Spikenard has warming, desiccative, and diuretic properties, and when it is drunk, it stops diarrhoea. As pessary, it stops uterine excretions and serous discharges (Diosc. 1.7.3). When drunk in cold water, it relieves nausea, heartburn, flatulence, liver ailments, jaundice and renal dysfunction. Boiled in water, the vapours relieve uterine inflammation. It relieves purulent blepharitis, it tones the eyelids and increases the growth of eyelashes. It is also used in combination with antidotes. When it is mixed with wine, it can be applied as eyemedication (Diosc. 1.7.4).

- Modern description:

The rhizome and root are used for the essential oil (Williamson 2003:412). The oil contains polyacetylenes falcarinone and falcarinolene, as well as the glycoside araloside (Williamson 2003:412). It was formerly used for rheumatic disorders (Williamson 2003:412).

Storax *Styrax officinalis* L.

English - Styrax, sweet gum, levant storax

Storax, however, causes headaches, and it is heavy and soporific (Diosc. 1.66.3). According to Dioscorides (1.66.2), storax has heating, emollient and digestive properties. It is effective for coughs (See also Plin. *H.N.* 26.48), catarrhs, discharges from the nostrils, hoarseness of the voice, loss of voice, and ringing in the ears (See also Plin. *H.N.* 24.24). It is suitable both for cervical stoppages and indurations, it induces menstruation and it gently softens the bowel. It is also used as an emollient and used in combination with analgesics. Pliny adds that storax acts as antidote, emmenagogue, it loosens bowels and dispels melancholy. It also acts as local application for scrofolous sores and knotty lumps on the sinews (Plin. *H.N.* 24.24).

- Modern description:

It is mainly used in Asia for the resin which contains cinnamic acid and esters. Its medicinal value is for skin disorders and it is a source of Levant storax (Balm of Gilead) (Van Wyk *et al.* 2004:415). The balsam is used (Williamson 2003:417).

Wild rue *Ruta graveolens* L.

English - Garden rue, Herb of Grace, Herbygrass

Syrians – bessasa

Cappadocians - moly

The rue is warming, burning, ulcerating and diuretic and acts as an emmenagogic. It stops diarrhoea and acts as an antidote to deadly poisons (Diosc. 3.45.1). When it is boiled, it stops colic, pains in the sides and chest, dyspnea, coughs, inflammation of the lungs, pains of the hip joints, other joints and periodic shiverings. It is also good for inflations of the colon, the uterus, intestinum and rectum and it relieves uterine suffocation (Diosc. 3.45.2). It also expels intestinal worms and relieves internal

edemata. It also assuages severe eye pains and headaches. It stops nosebleeds and it is good for inflammations of the testicles and pustules (Diosc. 3.45.3). Wild rue treats dull white leprosy, it lifts warty excrescences and it is food for lichen-like eruptions of the skin. The juice is good for earache (See also Plin. *H.N.* 20.137), it helps for dim-sightedness and treats erysipelas, shingles and scurf (Diosc. 3.45.4). Taken in wine or applied with vinegar and rose oil, it likewise relieves headaches; if however the headache is chronic, barley flour and vinegar should be the other ingredients. The plant relieves headaches, indigestion, flatulence and chronic pains of the stomach (Plin. *H.N.* 20.135).

- Modern description:

Rutin is the constituent that is responsible for the anti-inflammatory effect (Williamson 2003:380). The plant contains flavonoids (notably the rutin) that reduce capillary fragility, that is why the juice of the plant has been used in treating **earaches** and chewing a leaf or two is said to quickly bring relief from nervous **headaches**. It is used in the treatment of a variety of complaints including eye strain, headache and sprains (Castro 1990:243). When it is mixed with wine, it has a **soporific effect** (Stannard 1962:298).

Other chemical compounds found are coumarins (rutaretin), furanocoumarins (bergaptin), furanoquinoline alkaloids (kokusaginine) and the volatile oil methyln-onylketone (2-unde-canone). The **Analgesic** effect cannot be clearly linked to a certain coumpound, but it is definitely present (Van Wyk *et al.* 1997:220).

CHAPTER 11
CONCLUSION

The ancients employed several methods for the alleviation of surgical or general pain and the induction of sedation or Anaesthesia. Across the world, peoples of a thousand ethnic, cultural and historical traditions share a wealth of useful medicinal plants. It can be argued that the roots of this rich system of knowledge date back in evolutionary history to before we were humans at all, back to our primate ancestors. We can be certain that humans across millennial space and time have a powerful shared heritage of knowledge of useful medicinal plants (Moerman 2005:136). This study focused on a selection of such plants and examined why the ancient Greek and Roman herbalists and doctors favoured certain narcotic and analgesic plants in the treatment of their patients.

The underlying motive in undertaking this study was certainly to remove some of the skepticism and suspicion that exist about both ancient medicine and traditional South African medicines. An unexpected spin off was the confirmation of the close correlation that exists between two different peoples in two different eras, about 2000 years apart.

A thorough examination of ancient medical texts, led to the identification of Poppy, Mandrake, Datura, Henbane, Hemlock, Hellebore and Withania as the plants which were most commonly used by the Greeks and Romans to procure either an insensibility to or relief from pain. A selection was then made of those passages from ancient texts which describe how the ancients recognised, prepared, administered and used these plants. The description of each plant was then placed beside its modern description which included a phytochemical analysis of its active components in order to determine the accuracy (in modern terms) of the information obtained from the ancient sources.

Very early on it transpired that the ancients used general purposed therapies on the basis of empirical observations. The plants were used for multiple purposes and not one of them was used exclusively for the relief of pain. Many of these supposed or real effects were, however, related to their analgesic qualities and it was therefore

decided to include the wide-ranging possible and probable effects in the description and analysis. The medical practitioners of the time mostly obtained their knowledge of medicines through personal experience and trial and error, and to a lesser degree from oral and written tradition. This is how they learnt which medications would provide relief from pain and which narcotics should be handled with great care, since they could prove fatal if incorrect dosages were administered.

The human race has always been familiar with pain. Although the ancients did not really know the physiological reasons for pain or its pharmacological explanation, they experimented until they found plants that would relieve this symptom. More recently The International Association for the Study of Pain has defined pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (Sweetman 2002:02). In order to determine whether the plants, identified as analgesics in this study, could possibly reduce or eliminate this sensation it is necessary to look more closely at the modern exposition of the chain of physiological processes which finally result in the phenomenon of "pain".

Pain begins at special pain receptors scattered throughout the body. These pain receptors transmit messages as electrical impulses along nerves to the spinal cord and then upward to the brain. Sometimes the signal evokes a reflex response when it reaches the spinal cord; when this happens, a signal is immediately sent back along motor nerves to the original site of the pain, triggering the muscles to contract. The pain signal is also relayed to the brain. Only when the brain processes the signal and interprets it as pain does a person become consciously aware of it (Berkow 1997:288).

In modern pharmaceutical practice, we distinguish between pain for which narcotics are used and other pain such as acute and chronic pain. Not all kinds of pain require the use of opioid analgesics which is the type on which this study has focused.

While neuropathic pain,[347] pain related to psychological disorders[348] and pain related to e.g. arthritis and idiopathic pain[349] were treated with opioids in antiquity, they do not require the use of opioid analgesics in modern pharmacy. The following types of pain require the use of opioids:

1. **Acute pain during and after surgery**: the pain is constant and intermittent. Usually opioid (narcotic) analgesics are prescribed after surgery. They are most effective when taken every few hours (Berkow 1997:290).
2. **Chronic pain e.g. cancer pain** cause pain in several ways. The tumour can grow into bones, nerves, and other organs, causing mild discomfort or severe, unrelenting pain. Cancer treatments, such as surgery and radiation therapy, can also cause pain. Longer-acting opioid analgesics are prescribed more often because they provide more hours of relief between doses and generally allow a better night's sleep (Berkow 1997:290).

Analgesics, what they are and how they work

All the plants that were identified in the ancient texts, and on which this study was based, would have been successfully used to alleviate the kinds of pain described in each chapter. However, not all the plants had narcotic effects, even though they were useful to dull pain such as head, ear and toothache.[350] The ancient medical practitioners used specific plants to which they could ascribe the narcotic and soporific properties. In modern terms such plants with pain-relieving properties are known as analgesics. In modern medicine, several types of analgesics can help alleviate pain but three categories of analgesics are mainly found:

1. Opioid analgesics
2. Nonopioid analgesics
3. Adjuvant analgesics

---

347 **Neuropathic pain** caused by damage or dysfunction anywhere in a nerve pathway where an abnormality interrupts the nerve signals, which is abnormally interpreted in the brain (Sweetman 2002:2).

348 **Pain related to psychological disorders** (psychosomatic pain) occurs when the patients complains of persistent pain without evidence of any medical reason (Berkow 1997:290).

349 **Idiopathic pain** (when the cause of the pain is unknown) is also classified (Berkow 1997:291).

350 See Chapter 10

Opioid analgesics are the most powerful pain relievers and are the mainstay for treating severe pain because they are so effective by their depressant effect on the brain (Dreisbach 1987:324). They are all chemically related to morphine, a natural substance extracted from poppies, although some are extracted from other plants while others are produced in a laboratory. The narcotic analgesics produce variable effects on the central nervous system depending on the drug, the susceptibility of the patient, and the dosage (Dreisbach 1987:324). The following two types of analgesics are not used as narcotics but only for pain-relief.[351]

1. **Nonopioid analgesics** except acetoaminophen are nonsteroidal anti-inflammatory drugs which reduce inflammation, swelling, and irritation (Berkow 1997:291).
2. **Adjuvant analgesics** are drugs that are usually given for reasons other than pain but may relieve pain in certain circumstances for example, some antidepressants, anti-seizure drugs and oral local anaesthetics (Berkow 1997:293).

As it could be seen throughout the chapters, the narcotic plants were not only used in ancient times for the indications mentioned above, but also for toothache, earaches, body pains, arthritis, gout and menstrual pain.Today however opioids are not used for pain in general but for specific, intense pain.

In modern pharmaceutical practice we know that specific phytochemical properties exert specific effects. We also know that each plant has its own alkaloids, which leads to a specific action at a specific time.

Alkaloids

All the narcotic plants that were described contain alkaloids. It was possible to either confirm or refute the specific effects which the ancient authors claimed for each plant, according to its alkaloid content, since the effect obtained by administering the plant, is directly related to this active ingredient. In order to put the conclusions regarding the efficacy of the plants into context, a modern description of alkaloids is necessary.

---

351 See Chapter 10 for the effects of individual pain-relieving plants.

Alkaloids (alkali-like) are derived from plants and have a specific physiological effect on humans or animals (e.g. sleep or pain-relief). They show great variety in their botanical and biochemical origin, in chemical structure and in pharmacological action (Evans 2002:333). Herbs and herbal medicines (recently referred to as phyto-medicines) contain the complex chemistry of whole plants or plant parts used as remedy in contrast to single drugs derived from plants. The term alkaloid has been defined as a cyclic organic compound containing a nitrogen in a negative oxidation state, which has limited distribution in living organisms. Alkaloids are divided into several subgroups (Gurib-Fakim 2006:46).

Examples of different alkaloids found in the narcotic plants discussed are:

- Pyrrolidine alkaloids

Originating from the amino-acid ornithine, this group includes the tropane alkaloids, atropine, hyoscine and hyoscyamine from the nightshade family (Hyoscyamus and Datura). As a group these block parasympathetic nerve activity. This group also includes the 'truth-drug' scopolamine (Mills 1991:329).

- Isoquinoline alkaloids

Benzylisoquinoline is the precurser of morphine alkaloids, including morphine, codeine and thebaine (derived from Papaver) and papaverine (from the Mandrake) (Mills 1991:330).

In modern pharmaceutical chemistry, we know about water and lipid-solubility, from which we can predict which will have sympathic effects, which of these we can use transdermally and which of the medicines would induce narcotic effects.

Poppy is the principle narcotic described in this thesis, mainly because of its potency, its ability to induce anaesthesia and its analgesic property. It is possible to identify positively the ancient poppy as the plant which we know today as *Papaver somniferum*. Not only does the morphology correspond, but also the indications and the method used to obtain the latex (§2.15).

Pain-relief and the inducement of sleep were the most common uses in antiquity. These effects were due to the large quantities of alkaloid found in the plant, with morphine as the principle alkaloid (§2.11.1). Thebaine (another alkaloid) is a powerful narcotic which induces sleep and relieves pain (§2.13.5). Papaverine also produces

a light sleep since it slows the heart rate (§2.13.2). Narcoteine has a depressant action and is also used as a hypnotic drug (§2.13.4). Other indications which proved valid, include: inflammation, erysipelas, tooth and earache, gout and colic, due to the sedating and analgesic effects of the alkaloids, while "upward" purging and ulcers are valid due to the side-effects of morphine (§2.14). Painful urination is not a valid indication, since morphine inhibits the voiding reflex. It seems unlikely that "downward" purging would result from the use of poppy, since morphine causes constipation. It is thus possible to identify poppy as a successful ancient narcotic and soporific due to its high content of morphine, thebaine and narcoteine (§2.15) and as an effective pain reliever and anti-inflammatory medication due to the presence of papaverine.

The ancient morphology and distribution of **Mandragora** correlates with modern descriptions (§3.14). The most important property which the ancients ascribed to mandragora was its ability to induce a deep sleep and to relieve pain. Mandragora would definitely have this effect because it contains the alkaloid hyoscine, which causes central nervous system depression, which in turn leads to drowsiness, fatigue and a dreamless sleep (§3.12). Hyoscyamine in combination with atropine leads to coma and hallucinogenic activity due to the inhibition of smooth muscles (§3.12). Atropine is administered as pre-medication before surgery, as it suppresses salivation. Thus, without knowing, the ancients actually were accurate in administering mandragora during Anaesthesia since it would have prevented the patient from choking in his own saliva. The description provided by phytochemistry makes it possible to classify mandragora as a valid ancient narcotic since its principle alkaloids would induce the effects which the ancients claimed for it..

The texts of Celsus, Pliny and Dioscorides all suggest positive use of **Hyoscyamus** for a number of therapies, especially in the alleviation or control of pain. Given the species' rich constituents of tropane alkaloids, modern pharmacognosy has confirmed the basic outlines of Graeco-Roman empirical observation in the effects and use of hyoscyamus.

Hyoscyamus was prescribed in ancient times as anodyne and perhaps also as anesthetic (§4.4.1). Phytochemistry confirms that atropine is not rapidly cleared from the blood and does not penetrate the blood-brain-barrier to induce sedation (§4.12), but scopolamine, which acts as an pain-reliever does. This means that hyoscyamus

was not primarily used as anesthetic, but rather to relieve pain after surgery. Hyoscyamus can thus be seen as an anodyne which was also used in narcotic mixtures in combination with mandragora or poppy

The description of the phytochemistry of **hemlock** found in modern sources correlates to such a degree with the observations made by the ancients, that it is possible to draw comparisons.

Sleep was an effect of hemlock which can be explained through modern phyto-chemistry since it contains the alkaloid coniine which is a sedative and antispasmodic (§5.14). Pain and inflammation would be relieved due to the paralysis of the motor nerve ends and depression of the central nervous system. Since coniine has a sedative effect on the motor centres, it acts as a local anodyne and an anti-inflammatory agent.

The ancients were therefore correct in using hemlock to induce sleep and to dull pain but this poison is indeed very dangerous and only one milligram too much can cause death – a property utilised by the ancients to exact capital punishment (§5.16).

Modern morphological descriptions (§6.10) of **Datura** indicate that the descriptions found in ancient sources (§6.2) probably refer to different stages of the plant's growth.

The ancients used Datura as a soporific (§6.6.1) and local anodyne (§6.6.2). Since the alkaloid atropine is water-soluble, it has a poor ability to penetrate the blood-brain barrier. This implies that it would not produce anaesthesia, since it is not such a strong narcotic drug. Hyoscine also exerts sedative effects, thus the use as soporific and local anodyne in antiquity was justified and would have resulted in successful treatment. Hyoscine (scopolamine) is also used in criminology as the so called "truth-drug" (§6.18) because it induces disturbed consciousness and at the same time causes loss of short term memory (twilight sleep). The anti-spasmodic property attributed to datura by the ancients is valid because of the spasmolytic effect of hyoscine, as well as the relief of motion sickness due to the scopolamine content (§6.16). The hallocinogenic effect is also a valid side-effect due to the scopolamine which stimulates the central nervous system (§6.6.3). Datura can thus be classified as a soporific and anodyne, but not as a narcotic drug.

Datura is a naturalised plant and is not indigenous to South Africa (Germishuizen 2003:914). It is used by traditional healers to relieve pain, as a hypnotic and as a mind-altering drug (§9.9.5) and according to the phytochemistry of datura (§6.15), these indications are also valid.

Hellebore is classified by Scarborough as a soporific plant (2009:1), but the evidence supplied by both the ancient and modern texts indicate that hellebore was mainly used as a purge (due to the helleborcin content). Although the helleborin exerts narcotic properties on the human body (§7.16), it cannot be seen as such a strong narcotic or even soporific drug (the dosage being 6.2 grams every four hours until the desired effect is obtained (§7.12)). Purging is is the main indication of hellebore and no explanations in modern texts can be found for the indications mentioned in antiquity (§7.17).

Withania's Latin name, *somniferum*, which, literally translated, means "bringer of sleep" indicates that its soporific effect was well known in the ancient world. The physicians used Withania mainly as **anodyne and analgesic** (§8.5.1). *W. somniferum* has the same effect on the pattern of smooth muscle activity as papaverine, (*P. somniferum*), although it does not contain the morphine of poppy, but the alkaloid somniferine. Somniferine is regarded as an excellent hypnotic. Research indicates that *W. somniferum* L. can be classified as a sedative and hypnotic (Watt 1963:1011) since the withanolides which are alkaloids exert smooth muscle relaxation which leads to deeper breathing, and eventual total relaxation of the body. Pliny writes that withania strengthens loose teeth (§8.5.2). With the help of modern science, we know that the alkaloids withanolides exerts anti-biotical and anti-inflammatory effects (§8.14). Withania is also a remedy for adjuvant-induced arthritis due tot the immune-suppressing effect of withaferin A. New research shows that Withania can effectively be used to counteract tumours because of the cell differentiation which withanolides induce (§8.14.1). The anodyne and analgesic properties such as the relief of toothache claimed by the ancient authors for withania are valid and it is known today that the active ingredients (somniferine, withanasomnine and withanolides) which are present in Withania (§8.12) are actually capable of inducing sleep. Withania is an indigenous plant of Southern Africa but it is widely distributed throughout the world (§9.9.7). It is difficult to see a correlation between the indications for which the ancients and the traditional healers respectively used withania. The traditional healers focus on relief which withania would give from

syphilis, but this relief would mainly be restricted to the pain and inflammation which are associated with the condition (§9.9.7).

It is evident from both the individual descriptions of the plants in their respective chapters and this summative chapter that all the plants could be positively identified and described in modern terms. All of the plants discussed, proved to exert either anesthetic or soporific and analgesic effects. Although the ancients' knowledge regarding the specific effect was based on guesswork, modern science makes it possible to predict the effects accurately by means of phytochemistry which identifies the active ingredient. Morphine, thebaine and narcoteine, helleborin, papaverine and somniferine all have narcotic properties, while hyoscyamine, hyoscine, atropine, as well as the withanolides exert analgesic effects.

The fact that a plant was used in antiquity for a certain disease does not mean that it qualifies to be used for the same purpose in modern times. Even though ancient doctors perhaps realised the healing properties of certain plants and used them according to their pharmacological effects it is also possible that they used a plant for its beautiful flowers, leaves, its colour or its form of root. The evolution of medicine brought the lethal properties of these substances to the attention of researchers (§4.14; 5.16; 6.18; 7.16) and led to the restriction of their use in more standardised doses in the form of poultices, decoctions, drops or inhalations either in unadulterated form or in mixtures (Ramoutsaki *et al.* 2002:43). Due to the toxicity of hemlock, it is not pharmacologically used anymore, although the ancients employed it for several indications (§5.17). The same applies to Mandragora (§3.13; 3.16).

The fact that the ancients relied to a large degree on trial and error to discover the medicinal value of plants, resulted in occasional incorrect assumptions regarding their efficacy in the treatment of certain complaints – mistakes that the analysis of their phytochemical properties have brought to the fore. For example, Poppy ~~that~~ was used in antiquity for painful urination, but it is phytochemically proven that morphine inhibits the voiding action and this would result in even more pain (§2.15). Hemlock was used to stop nose bleeding, but coniine is a vasodilator which would actually increase the bleeding (§5.17). The analysis has, however, revealed that the ancients were more often right than wrong in their assumptions.

It was not feasible to list all the medicinal plants which were used as narcotics or anodynes in ancient times, as well as all the anodynes used in Africa. For this reason

the study focused on those narcotics which have recently been identified as the most important ones (Scarborough 2009:01). The study was subsequently also restricted to the same families of the plants in African medicine, instead of treating each plant individually.

Modern medical practitioners should embrace the opportunity to rediscover the usefulness of ancient pharmaceutical practice. Although a large amount of knowledge has been lost through the ages, or has become less accessible as they were written in ancient languages, much remains available. Herbalists will confirm that natural medicine has fewer adverse effects than synthetic medicine. Van Wyk *et al.* (2002:8) stress that natural products and their derivatives represent more than 50% of drugs that are chemically compounded and used in treatment. Plants thus continue to supply mankind with new remedies. Pharmacists also increasingly show a preference to dispense natural products rather than synthetic alternatives (Van Wyk *et al.* 2003:7).

While comparing the modern medication with those of the ancients, a big difference in treatment by means of medication became apparent. The ancients would treat the symptoms and look at a disease as a compilation of symptoms, while modern practitioners treat a patient according to the specific disease.

Ancient medicine provides a key to the future of pharmaceutics. The tendency to "look to nature" to supply humans with cures that are free of harmful side effects, is evident in the popularity of herbal medicine provided by an ever increasing number of health shops. Ancient sources contain a rich supply of such remedies which can be used to great effect, not only in natural and homeopathic cures, but also in modern pharmaceutical medicines.

REFERENCE LIST

ABDULLAEV, F.I. 2002. Cancer chemopreventive and tumoricidal properties of saffron (*Crocus sativus* L.). *Experimental Biology and Medicine*. 227:1-5.

AFRICA, T.W. 1961. The opium addiction of Marcus Aurelius. *Journal of the History of Ideas*. 97-102.

ALLEN, D.E. & HATFIELD, G. 2000. *Medicinal plants in folktradition: An ethnobotany of Britian and Ireland*. Cambridge: Timberpress.

ANDERSON, R.A. 2005. Polyphenols from Cinnamon Increase Insulin Sensitivity: Functional and Clinical Aspects. *Dietary Antioxidants, Trace Elements, Vitamins and Polyphenols*, 4:154.

ARNOLD, T.H., PRENTICE, C.A., SNYMAN, E.E., TOMALIN, M., OTTAS-BIRCHER, C. & ROUCH, N.R. 2002. *Medicinal and magical plants of southern Africa: an annotated checklist*. Pretoria: National botanical institute.

ASSIMOPOULOU, A.N., PAPAGEORGIOU, V.P. & SINAKOS, Z. 2005. Radical scavenging activity of *Crocus sativus L.* extract and its bioactive constituents. *Phytotherapy Research*, 19:11.

AVERY, A.G., SATINA, S. & RIETSEMA, J. 1959. *The genus Datura*. New York: Ronald Press Co.

AVIRAM, M. & DORNFELD, L. 2001. Pomegranate juice consumption inhibits serum angiotensin converting enzyme activity and reduces systolic blood pressure. *Atherosclerosis.*, 158(1):195-198.

BAXTER, H., GIBBONS, S., WILLIAMSON, S. & HEINRICH, M. 2004. *Fundamentals of pharmacognosy and phytotherapy*. London: Churchill Livingstone.

BECK, L.Y. 2005. *Pedanius Dioscorides of Anazarbus. De Materia Medica*. Hildesheim: Olms-Weidemann.

BENDER, T., KARAGÜLLE, Z., BÁLINT, G.P., GUTENBRUNNER, C., BÁLINT, P.V. & SUKENIK, S. 2005. The use of water for medical treatment. *Rheumatology International.* 25:3.

BENNET, C.E. 1925. *Frontinus. Strategems.* London: Heinemann.

BERENDES, J. 1902. *Des Pedanios Dioskurides aus Anazarbos. Arzneimittellehre in fünf Büchern.* Schaan, Liechtenstein: Sändig Reprint Verlag.

BERKOW, R. 1997. *The merck manual of medical information.* Rabway, New Jersey: Merck research laboratories.

BISSET, N.G. 1994. Herbal drugs and phytochemicals. Stuttgart: Medpharm Scientific publishers.

BLACKWITH, J.V. 1998. Herbal medications and nutraceuticals used to treat rheumatoid or osteoarthritis. Miller, L.G. & Murray, W.J., *Herbal medicinals: A clinician's guide.* New York: Pharmaceutical products press.

BLOOM, F.E. 1990. Neuro-humoral transmission and the central nervous system. 8th ed. (*In Goodman and Gillman: The pharmacological basis of therapeutics.* New York: Pergamon Press.

BLUMENTHAL, M. & ISRAELSEN, J.D. 1998. The history of herbs in the United States: Legal and regulatory perspectives. Miller, L.G. & Murray, W.J., *eds. Herbal medicinals: A clinician's guide.* New York: Pharmaceutical products press.

BROCK, J. 1916. *Galen. On the natural faculties.* London: Heinemann.

BROWN, J.H. & TAYLOR, P. 1996. Muscarinic receptor agonists and antagonists. 9th ed. (*In Goodman and Gillman: The pharmacological basis of therapeutics.* New York: McGraw-Hill.

BUDAVARI, S. 2001. *The Merck Index: An encyclopedia of chemicals, drugs, and biochemicals.* Rabway, N.J.: Merck & Co. Inc.

BYBEL: NUWE VERTALING. 1983. Kaapstad: Bybel genootskap van Suid Afrika.

CARTER, A.J. 1996. Aspects of drugs: Narcosis and nightshade. *B.M.J.* (313):1630-1632.

CASTRO, M. 1990. 1990. *The Complete Homeopathy Handbook.* London: Macmillan.

CHRISTMAN, S. 2008. *Cannabis sativa. Floridata*, http://www.floridata.com/ref/C/cann_sat.cfm. Date of access: 7 Jul. 2007.

CHURCH, F.J. 1906. *The trial and death of Socrates being the Euthyphron, apology, Crito and the Phaedo of Plato.* London: Macmillan and Co.

CILLIERS, L. & RETIEF, F. 2000. Poisons, poisoning and the drug trade. *Akroterion.* (45):88-100.

CONKLIN, M.E. 1976. *Genetic and biochemical aspects of the development of Datura.* Monographs in Developmental biology. New York: Karger.

CULPEPER, N. 1981. Costmary, or Alcost, or Balsam Herb. *Culpeper's Complete Herbal, and English Physician.* http://www.bibliomania.com/2/1/66/113/21003/1/frameset.html.

DALBY, A. 1998. Cato. De re agricultura. Totnes: Prospect books.

DAVIS, P.H., EDMONDSON, J.R., MILL, R.R. & PARIS, B.S. 1978. *Flora of Turkey and the East Aegean Islands.* New York: Blackwell Publishing.

DONERAY, H., ORBAK, Z. & KARAKELLEOGLU, C. 2007. Clinical outcomes in children with *Hyoscyamus niger* intoxication no receiving physostigmine therapy. *European Journal of Emergency Medicine*, 14(6):348-350.

DREISBACH, R.H. & ROBERTSON, W.O. 1987. *Handbook of poisoning.* 12th ed. Connecticut: Prentice-Hall.

DUKE, J.A. 1983. *Medicinal plants of the Bible.* Owerri, NY: Trado-Medic Books.

DUKE, J.A. 1985. *Handbook of medicinal herbs.* Boca Florida: CRC Press.

EINARSON, B. & LINK, G.K.K. 1976. *Theophrastus. De Causis Plantarum.* Cambridge, Mass: Harvard University Press.

EISEN, G. 2003. Cinquefoil. *Medcentive*, http://www.medencentive.com/HG_EBM_ClientApplication/GetLibraryDocument.aspx?qid=4164&topicId=103&eid=&customerId=&viewTypeId=2&SectionID=13&un=&pd=. Date of access: 4 Jul. 2007.

EVANS, W.C. 1996. *Trease and Evans' Pharmacognosy*. London and Philadelphia: Saunders.

EVANS, W.C. 2001. *Trease and Evans Pharmacognosy*. . London: W.B. Saunders.

FOLLETTE, W. 1992. *Western wetland flora: Field office guide to plant species*. http://plants.usda.gov/java/profile?symbol=COMA2. Date of access: 25 Aug. 2007.

FOWLER, H.N. 1920. *Plato. Phaedo.* Cambridge, Mass: Harvard University Press.

GABEL, T.P. 1998. Herbal medications, nutraceuticals, and anxiety and depression. Miller, L.G. & Murray, W.J., *eds*. *Herbal medicinals: A clinician's guide*. New York: Pharmaceutical products press.

GERMISHUIZEN, G. & MEYER, N.L. 2003. Plants *of Southern Africa: an annotated checklist*. Pretoria: National Botanical Institute.

GHELDOF, N., WANG, X. & ENGESETH, N.J. 2008. Identification and quantification of antioxidant components of honeys from various floral sources. *J.Agric.Food Chem*, 152(1):118-133.

GIBBON, C.J. 2005. South African Medicines Formulary (SAMF). Cape Town: Health and Medical Publishing Group of the South African Medical Association.

GILL, N.S. 1999. Four humors: The Hippocratic method and the four humors in medicine. *Ancient History* 1-3. http://ancienthistory.about.com/cs/hippocrates/a/hippocraticmeds.htm. Date of access: 31 Aug. 2008.

GILLESPIE, S. 1998. Herbal medicines for dermatologic use. Miller, L.G. & Murray, W.J., *eds*. *Herbal medicinals: A clinician's guide*. New York: Pharmaceutical products press.

GREENHILL, W.A.G. 1870. Androcydes. William Smith, *ed*. *Dictionary of Greek and Roman Biography and Mythology*. London: John Murray.

GRIEVE, M. 1931. *A modern herbal: The Medicinal, Culinary, Cosmetic and Economic Properties, Cultivation and Folk-Lore of Herbs, Grasses, Fungi, Shrubs*

and Trees with their Modern Scientific Uses In Two Volumes. New York: Dover Publications, Inc.

GROLLMAN, A. & SCARBOROUGH, J. 2005. Verbal communications with the author.

GUERBER, H. 1893. *Myths of Greece and Rome.* New York: American Book Company.

GUPTA, M.K. 2008. Botanical extracts of Nelumbo nucifera.

GURIB-FAKIM, A. 2006. Medicinal plants: Traditions of yesterday and drugs of tomorrow. *Molecular aspects of medicine*, 27(1):1-93.

GUTSTEIN, H.B. & AKIL, H. 2001. Opioid Analgesics. Hardman, J.G. & Limbird, L.L., *eds. Goodman and Gilman's Pharmacological Basis of Therapeutics.* New York: Mc Graw-Hill. p. 569-619.

HAMILTON, W.R. & STOHS, S.J. 1998. Hepatic effects of herbal remedies. Miller, L.G. & Murray, W.J., *eds. Herbal medicinals: A clinician's guide.* New York: Pharmaceutical products press.

HAMMOND, N.G.L. & SCULLARD, H.H. 1970. *The Oxford classical dictionary.* 2nd ed. Oxford: Clarendon Press.

HANSON, J.A. 1989. *Apuleius; Metamorphoses II.* Cambridge Mass.: Harvard University Press.

HAQQI, T.M. 2005. Pomegranate Fruit Shown To Slow Cartilage Deterioration in Osteoarthritis. *Journal of Nutrition.* http://www.sciencedaily.com/releases/2005/09/050901072114.htm. Date of access: 10 Jun. 2007.

HARBONE, J.B. & BAXTER, H. 1993. *Phytochemical Dictionary: A handbook of bioactive compounds from plants.* London; Washington, D. C: Taylor & Francis.

HARTWELL, J.L. 1967. Plants used against cancer. A survey. *Lloydia.* 30-34.

HENRY, T.A. 1924. *The plant alkaloids.* London: J. & A. Churchill.

HOFFMANN, D. 2003. *Medical herbalism - The science and practice of herbal medicine.* Rochester, Vermont: Healing Arts press.

HOLLEMAN, M.C. 1998. Herbal medicine and substance abuse. Miller, L.G. & Murray, W.J., *eds.* *Herbal medicinals: A clinician's guide*. New York: Pharmaceutical products press.

HOLZMAN R.S. 1998. The legacy of Atropos, the fate who cut the thread of life. *The journal of the America society of Anesthesiologists.* 89(1):241-249.

HORT, A. 1916. *Theophrastus. Enquiry into plants and minor works on odour and weather signs.* 2nd ed. London: Heinemann.

HUMPHREY, A.J. & O'HAGAN, D. 2001. *Tropane alkaloid biosynthesis. A century old problem unresolved.*

HUTCHINGS, A. 1996. *Zulu Medicinal plants.* Pietermaritzburg: University of Natal Press.

IKEDA, H., YAMAMOTO, H., FUJIN, H., KISAKI, Y., UCHIDA, H., ISHIMARU, Y., HASUMI, T. & HAMAJIMA, A. 2004. Umbilicoplasty for large protruding umbilicus accompanying umbilical hernia: a simple and effective technique. *Pediatric Surgery International.* 20(2):105-107.

IWU, M.M. 1993. *Handbook of African medicinal plants.* Boca Raton, Florida: CRC Press.

JACKSON, B.P. & WALLIS, E. 1995. *Datura stramonium* and *Datura tatula.* *J.Pharm.*, 7:384.

JAFFE, J.H. & MARTIN, W.R. 1990. Opioid analgesics and antagonists. 8th ed. (*In Goodman and Gillman: The pharmacological basis of therapeutics.* New York: Pergamon Press.

JONES, W.H.S. 1951. Pliny *Natural History.* Cambridge, Mass.: Harvard University Press.

JUNGNICKEL, P.W. 1998. Nutraceuticals for management of dyslipidemia and atherosclerosis. Miller, L.G. & Murray, W.J., *eds.* *Herbal medicinals: A clinician's guide*. New York: Pharmaceutical products press.

KENNEDY, S.K. & LONGNECKER, D.E. 1990. History and principles of anaesthesiology. 8th ed. *Goodman and Gillman: The pharmacological basis of therapeutics.* New York: Pergamon Press.

KINCHELOE, L. 1998. Gynecological and obstetric concerns regarding herbal medicinal use. Miller, L.G. & Murray, W.J., *eds*. *Herbal medicinals: A clinician's guide*. New York: Pharmaceutical products press.

KRESS, H. 2008. *Conium maculatum.* http://www.henriettesherbal.com/eclectic/bpc1911/conium.html Date of access: 24 Aug. 2007.

KÜHN, C.G. 1964. *Cl. Galeni Opera omni.* 20 ed. Hildesheim: Georg Olms.

LANSKY, E.P. & NEWMAN, R.E. 2007. *Punica granatum* (pomegranate) and its potential for prevention and treatment of inflammation and cancer. *Journal of Ethnopharmacology*, 109(2):177-206.

LEE, M.R. 2008. Solanaceae IV: Atropa belladonna, Deadly nightshade . *J R Coll Physicians Edinb.,* (37):77-84.

LEFFINGWELL, J.C. 1999. *Rose (Rosa damascene). Aroma from carotenoids. Leffingwell*, http://leffingwell.com/rose.htm Date of access: 3 Jul. 2007.

LEWIS, C.T. & SHORT, S. 1975. *A Latin dictionary.* Founded on Andrews' edition of Freund's Latin dictionary. Revised, enlarged and in great part rewritten. Oxford: Clarendon Press.

LEWIS, W.H. & ELVIN-LEWIS, M.P.F. 1977. *Medical botany: Plants effecting man's health.* New York: John Wiley and Sons.

LIDDELL, H.G., SCOTT, R. 1966. *Greek-English Lexicon.* London: Oxford University Press.

LIPPINCOTT, W; WILLIAMS, W.P. & WILKENS, C.G. 2006. *Gravel.* Stedman's Medical Dictionary.

LOPEZ, T.A., CID, M.S. & BIANCHINI, M.L. 2004. Biochemistry of Hemlock alkaloids and their acute and chronic toxicity in livestock: A review. *Toxicon*, (37):847-865.

LUCE, J.V. 2001. Greek medicine from Asclepius to Hippocrates. *Ir.J.Med.Sci.*,(170):200-202.

LUND W. 1911. *The British Pharmaceutical Codex.* London: Council of the Pharmaceutical Society of Great Britain.

LYONS, A.S. 2007. *Medicine in Roman times. Health guidance.* http://www.healthguidance.org/entry/6340/1/Medicine-in-Roman-Times.html. Date of access: 16 Jun. 2008.

MACHT, D.I. 1915. The history of opium and some of its preparation and alkaloids. *JAMA*,(64):467-471.

MARTIN, E.A. 2002. *Oxford concise medical dictionary* . 6th ed. London: Oxford University Press.

MERTENS-TALCOTT, S.U. 2006. Absorption, metabolism and antioxidant effects of pomegranate (*Punica granatum*) polyphenols after ingestion of a standardized extract in healthy human volunteers. *J Agric Food Chem*, 54(23):8956-8961.

MILLER, L.G. 1998. Herbal medications, nutraceuticals, and diabetes. In *Herbal medicinals: A clinician's guide*. Miller, L.G. & Murray, W.J., *eds*. New York: Pharmaceutical products press.

MILLER, L.G. & KAZAL, L.A. 1998. Herbal medications, nutraceuticals, and hypertension. Miller, L.G. & Murray, W.J., *eds*. *Herbal medicinals: A clinician's guide*. New York: Pharmaceutical products press.

MILLER, L.G. & WALLACE, J.M. 1998. Specific toxicologic considerations of selected herbal products. Miller, L.G. & Murray, W.J., *eds*. *Herbal medicinals: A clinician's guide*. New York: Pharmaceutical products press.

MILLS, S.Y. 1991. *The essential book of herbal medicine*. London: Penguin Arkana.

MISHRA, L.C. & SINGH, B.B. 2000. Scientific basis for the therapeutic use of *Withania somnifera* (Ashwagandha). *Alternative Medicine Review*, 5(4):334-346.

MOERMAN, D.E. 2005. Dilemmas and solutions: Native American plant knowledge. Yaniv, A. & Bachrach, U., *eds*. *Handbook of medicinal plants*. New York: The Haworth medical press.

MUKHERJEE, P.K., DAS, J., SAHA, K., PAL, M. & SAHA, B.P. 1966. Antipyretic activity of *Nelumbo nucifera* rhizome extract. *Indian-J-Exp-Biol.*, 34(3):275-276.

MULLER, G.J. 2005. *Mandrax.* Tygerberg Poison Information Centre. *Poison centre*, https://www.givengain.com/unique/sasom/upload/tox-mandrax.pdf. Date of access: 7 Jul. 2005.

MURRAY, J.A.E. 1993. *The Oxford English Dictionary: Being a corrected re-issue with an introduction, supplement, and bibliography of a new English dictionary on historical principles* / founded mainly on the materials collected by the Philoligical Society . 12 ed.

NEUWINGER, H.D. 2000. *African traditional medicine. A dictionary of plant use and applications.* Stuttgart: Medpharm scientific publishers.

NEWALL, C.A., ANDERSON, L.A. & PHILLIPSON, J.D. 1996. *Herbal medicines: A guide for health-care professionals.* London: The pharmaceutical press.

OFFICE OF NATIONAL DRUG CONTROL POLICY. 2008. Heroin. http://www.whitehousedrugpolicy.gov/streetterms/ByType.asp?intTypeID=5. Date of access: 9 Aug. 2008.

PARRY, C. 2008. *Cannabis and mandrax use in South Africa.* Fact sheet by: Alcohol & Drug Abuse Research Group: Medical Research Council. http://www.sahealthinfo.org/admodule/cannabis.htm Date of access: 6 Jul. 2008.

PERRY, E.K., MILNER, L. & HOUGHTON, P.J. 2000. From ancient texts to modern phytotherapy: plants in mind. *Herbal medicine: a concise overview for professionals.* Oxford: Butterworth-Heinemann. *Herbal medicine: a concise overview for professionals.* Oxford: Butterworth-Heinemann.

PERRY, L.M. 2000. *Medicinal plants of the East and Southeast Asia.* Cambridge, Mass.: MIT Press.

PFAF (PLANTS OF A FUTURE). 2008. Edible, medicinal and useful plants for a healthy world. *PFAF*, http://www.pfaf.org/database. Date of access: 11 Aug. 2008.

PIKOULIS, E.A., PETROPOULOS, J.C. & TSIGRIS, C. 2004. Trauma management in ancient Greece: value of surgical principles through the years. *World J.Surg.*,(28):425-430.

PRAY, W.S. 2006. Recent developments in poison control. *US Pharmacist*, 31(3):10-15.

PULSE, W.A. 2008. Information resource portal for lupins. *Lupin organization*, http://www.lupins.org/lupins/ Date of access: 12 Aug. 2008.

RACKHAM, H. 1952. Pliny *Natural History*. Cambridge, Mass.: Harvard University Press.

RAMOUTSAKI, I.A., ASKITOPOULOU, H. & KONSOLAKI, E. 2002. Pain relief and sedation in Roman Byzantine texts: *Mandragoras officinarum, Hyoscyamus niger* and *Atropa belladonna*. *International Congress Series*,(1242):42-50.

RAZZAKOV, N.A., ARIPOVA, S.F., AKHMEDOVA, E. & KARIMOV, A. 1998. Alkaloids of *Mandragora turcomanica*. *Chem.Nat.Comp.*,(34):741-742.

REISINE, T. & PASTERNAK, G. 1996. Opioid analgesics and antagonists. 9th ed. (*In Goodman and Gillman: The pharmacological basis of therapeutics)*. New York: McGraw-Hill.

RETIEF, F.P. & CILLIERS, L. 2007. Marcus Aurelius se siektegeskiedenis en dood: was hy 'n opiumverslaafde? *Tydskrif vir Geesteswetenskappe*, 47(1):56-65.

ROBBERS, J.E. & TYLER, V.E. 1999. *Tyler's herbs of choice: The therapeutic use of phytomedicinals*. New York: The Haworth herbal press.

ROSS, I.A. 2001. *Medicinal plants of the world*. New Jersey: Humana press.

SAYYAH, M., SAROUKHANI, G., PEIROVI, A. & KAMALINEJAD, M. 2003. Analgesic and anti-inflammatory activity of the leaf essential oil of *Laurus nobilis* Linn. *Phytother Res*, 17(7):733-736.

SCARBOROUGH, J. 1995. The opium poppy in Hellenistic and Roman medicine. Porter, R. & Teich, M., *eds*. Drugs and narcotics in history. Cambridge: University Press. p. 4-23.

SCARBOROUGH, J. 2002. Herbs of the field and herbs of the garden in Byzantine medicinal pharmacy. Littlewood, A., Maguire, H. & Wolschke-Bulmahn, J., *eds*. *Byzantine Garden Culture*. Washington, D.C.: Dumbarton Oaks. p. 177-188.

SCARBOROUGH, J. 2006. Drugs and drug lore in the time of Theophrastus: Folklore, magic, botany, philosophy and the rootcutters. *Acta Classica*, 44:91-30.

SCARBOROUGH, J. 2008. Verbal communications with the author.

SCARBOROUGH, J. 2009. Thornapple in Graeco-Roman pharmacology. *Classical Philology*, 104:1-14.

SCHULTES, R.E. 1976. *The Golden Guide - Hallucinogenic Plants.* New York: Western Publishing Company, Inc.

SCHULTES, R.E. & HOFFMANN, A. 1979. *Plants of the Gods: Origins of hallucinogenic use.* London: Hutchinson & Co.

SHERWOOD, L. 2001. Human physiology. From cells to systems. 4th ed. Pacific Grove: Brooks/Cole.

SIEGEL R.E. 1976. *Galen on the affected parts* . Basel: S Karger.

SIEGEL, R.E. 1973. *Galen on psychology, psychopathology and function and diseases of the nervous system.* Basel: S. Karger.

SIMON, J.E., CHADWICK, A.F. & CRAKER, L.E. 1984. *Herbs: An Indexed Bibliography.* 1971-1980. The Scientific Literature on Selected Herbs, and Aromatic and Medicinal Plants of the Temperate Zone. Hamden, C.T.: Archon Books.

SMYTH, J.R., JACOBSEN, J.D. & HAZEN, R.M. 2000. Comparative crystal chemistry of dense oxide minerals. *Reviews of Mineralogy* , 401-24.

SOFOWORA, A. 1982. Medicinal plants and traditional. New York: John Wiley and Sons Ltd.

SPENCER, W.G. 1935. *Celsus. De Medicina.* London: Heinemann.

STANNARD, J. 1962. The Plant Called Moly . *Osiris*, 14:254-307.

STARR, C. & TAGGART, R. 1995. *Biology: the unity and diversity of life.* 7th ed. London: Wadsworth Publishing Co.

STEIN, L. 2005. Olive oil contains natural anti-inflammatory agent. *Nutrition / Diet News.*,

SWEETMAN, S.C. 2002. *Martindale: The complete drug reference.* 33rd ed. London: Pharmaceutical Press.

TALLMADGE, C.K. 1946. Some anesthetics of antiquity. *J Hist Med Allied Sci*,(1):515-520.

TARAN, L. 1970. Anaxilaus of Larissa. *Dictionary of Scientific Biography*. New York: Charles Scribners Sons.

TAZMANIA DEPARTMENT OF JUSTICE. 2008. *The types of poppies and how to identify them.*

THACKERAY, H.ST.J. 1927. *Josephus in The Jewish war.* Cambridge, Mass.: Harvard University Press.

TURNER, J. 2004. Spice: *The history of a temptation*. London: Vintage Books.

TURNER, L. 2006. *Daily drug use.* Cape Town: Tincture press.

UPHOF, J.C.TH. 1968. *Dictionary of Economic plants.* 2nd ed. Lehre: Verlag von J. Cramer.

USHER, G. 1974. *A dictionary of plants used by man.* London: Constable.

VAN WYK, B.E., VAN OUDTSHOORN, B. & GERICKE, N. 1997. *Medicinal plants of South Africa.* Pretoria: Briza Publications.

VAN WYK, B.E. & GERICKE, N. 2000. *People's plants. A guide to useful plants in South Africa.* Pretoria: Briza Publications.

VAN WYK, B.E., VAN HEERDEN, F. & VAN OUDTSHOORN, B. 2002. *Poisonous plants of South Africa.* Pretoria: Briza Publications.

VAN WYK, B.E. & WINK, M. 2004. *Medicinal plants of the world.* Pretoria: Briza Publications.

WALLACE, J.M. 1998. Herbal medicines for colds and flu. Miller, L.G. & Murray, W.J., *eds. Herbal medicinals: A clinician's guide.* New York: Pharmaceutical products press.

WALLACE, J.M. 1998. Herbal medications for gastrointestinal problems. Miller, L.G. & Murray, W.J., *eds. Herbal medicinals: A clinician's guide.* New York: Pharmaceutical products press.

WATT, J.M. & BREYER-BRANDWIJK, M.G. 1962. *The medicinal and poisonous plants of Southern and Eastern Africa.* Edinburgh: E. & S. Livingstone Ltd.

WEINER, M.A. 1980. *Earth Medicine, Earth Food.* New York: Ballantine Books.

WELLMANN, M. 1906. *Pedanii Dioscuridis Anazarbei.De Materia Medica Libri quinque*. Berlin: Weidmann.

WILLIAMSON, E.M. 2003. *Potter's Herbal Encyclopedia: The authoritative reference work on plants with a known medical use*. London: The C.W. Daniel company limited.

WOODWARD, M. 1994. *Gerard's herbal: the history of plants*. London: Studio editions Ltd.

WORLD HEALTH ORGANIZATION. 1991. *Guidelines for the assessment of herbal medicines. Herbalgram*, 134(28):13-20.

YEUNG.H.C. 1985. *Handbook of Chinese Herbs and Formulas*. Los Angeles: Institute of Chinese Medicine.

ZANOLI, P., AVALLONE, R. & BARALDI, M. 1998. Sedative and hypothermic effects by β-asarone, a main component of *Acorus calamus*. *Phytotherapy Research*, 12:S1.

ZARCONE, T. 2005. The myth of the mandrake, the 'Plant-Human'. *Diogenes*,(52):115-120.

ZOHARY, D. & HOPF, M. 2000. *Domestication of plants in the Old World*. 3rd ed. Oxford: University Press.