Фомина Т.Н.

MEDICINAL PLANTS & THEIR IMPORTANCE

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Английский язык в области производства и переработки лекарственных и эфиромасличных культур – Medicinal plants & their importance. Professional English for cultivation and processing technology of medicinal and essential-oil plants: учебное пособие/ Т.Н. Фомина. – М.: Изд-во РГАУ-МСХА имени К.А. Тимирязева, 2014. 138 с.

Настоящее учебное пособие предназначено магистрам и аспирантам аграрного вуза, обучающихся по программе подготовки "Технологии производства продукции овощных и лекарственных растений" для направления 35.04.05 "Садоводство", а также студентам и аспирантам всех форм обучения агрономических специальностей и пограничных дисциплин сельскохозяйственных вузов и слушателям дополнительной образовательной программы «Переводчик в сфере профессиональной коммуникации».

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ВВЕДЕНИЕ

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Аксеновой Галины Яковлевны
посвящается

Данное учебное пособие адресовано магистрам и аспирантам всех форм обучения по программе «Технологии производства продукции овощных и лекарственных растений» (направление 35.04.05 «Садоводство»), а также студентам агрономических специальностей и пограничных дисциплин сельскохозяйственных вузов. Содержит значимую информацию для преподавателей и специалистов, как в данных областях, так и прикладных отраслях сельского хозяйства.

Учебное пособие может быть рекомендовано как для аудиторной, так и для самостоятельной работы студентов. Преподаватели и студенты могут соблюдать последовательность, в которой представлены тематические разделы пособия или выбирать для изучения те из них, которые представляют для обучающихся наибольший интерес.

Структура пособия определяется практическими задачами курса, т.е. обучение студентов различным видам чтения оригинальной литературы по специальности, формирование навыков и умений быстро извлекать информацию в пределах проработанной тематики, вести беседу, участвовать в полемике, используя специальную терминологию, аннотировать и реферировать аутентичные профессионально-ориентированные тексты, а также формирование навыков информационного поиска.

Пособие состоит из 11 разделов, 10 из них включают в себя тексты на английском языке общенаучной и профессионально-ориентированной тематики по производству и переработке лекарственных и эфиромасличных растений. Тексты носят аутентичный характер и были разработаны на основе материалов современных научно-популярных журналов и открытых ресурсов Интернета. 11 раздел содержит серию тестов различной степени сложности. Тестовые задания охватывают изучаемый языковой материал, что позволяет использовать их как для текущего контроля в аудитории, так для самостоятельной работы.

Такая структура способствует дальнейшему развитию у обучающихся языковых навыков и формированию практических умений работы со справочной литературой необходимой для корректного восприятия и понимания аутентичных профессионально ориентированных текстов.

Настоящее учебное пособие может быть использовано как информационный материал при подготовке студентов к письменной переводческой деятельности в сфере профессиональной коммуникации.

INTRODUCTION

Medicinal plants belong to a big plant group with a great interest due to its pharmaceutical, cosmetic and nutritional application. In addition, they are also an alternative to traditional crop with species in high demand at the current international market.

The main purpose of this textbook is that students have an approach to economical importance, uses, botany and harvested processes of the most significant medicinal, aromatic, essential-oil and seasoning species plants. The objectives are:

1. to classify and identify essential-oil and aromatic plants, seasonings and medicinal plants;
2. to understand cultivation techniques and effectively apply current methodology for global plant diversity conservation strategy;
3. to learn and understand the most important active constituents;
4. to know the different groups of active components of these plants;
5. to identify the useful application of this kind of plant in nutritional, cosmetic, perfumery, liquor, phytotherapy and pharmacological industry.

It is expected to provide basic knowledge and skills related to production and chemical features of essences and extracts from medicinal plants as well.

The textbook is designed to promote developing all four skills with special emphasis on strategies of communicative reading and general academic vocabulary acquisition. Being taken from authentic up-to-date sources reading materials are sure to be used both with courses and for self-learning.

The book contains self-check tests and glossary.

The evaluation is a continuous assessment with test and course work assignments.

PART I

PLANTS AND PEOPLE
HOW COULD WE DO WITHOUT THEM?

"Through most of man's history, botany and medicine were, for all practical purposes, synonymous fields of knowledge, and the shaman, or witch-doctor – usually an accomplished botanist – represents probably the oldest professional man in the evolution of human culture."

R.E. Schultes, 1972

DID YOU KNOW?

- Humans have evolved with herbs and plants for hundreds of thousands of years. Using herbal medicine brings harmony and balance back to the body, because it allows the body to be just as responsible for the healing as the plant. Using harsh, synthetic chemical compounds, which have only been around for a hundred years or so (and have not usually been properly tested for long term safety), comes with the mentality that the body is a broken machine and needs to be fixed.

- The number of plant species discovered by humans since they began exploring the planet is some 270,000 species, although it is entirely possible that the total number of species on earth is closer to 400,000. Providing the major source of food for people the world over plants, however, are responsible for very much more than just nurishment.

⁎ROLE OF PLANTS IN HUMAN HISTORY⁎

Plants have also been used in the production of stimulant beverages (e.g. tea, coffee, cocoa, and cola) and inebriants or intoxicants (e.g., wine, beer, and kava) in many cultures since ancient times, and this trend continues till today. Tea (*Thea sinensis*) was first consumed in ancient China (the earliest reference is around CE 350), while coffee (*Coffea arabica*) was initially cultivated in Yemen for commercial purposes in the 9th century. The Aztec nobility used to consume bitter beverages containing raw cocoa beans (*Theobroma cacao*), red peppers, and various herbs. Nowadays, tea, coffee, and cocoa are important commodities and their consumption has spread worldwide. The active components of these stimulants are methylated xanthine derivatives, namely caffeine, theophylline, and theobromine, which are the main constituents of coffee, tea, and cocoa, respectively.

The most popular inebriants in society today are wine, beer, and liquor made from the fermentation of fruits and cereals. Wine was first fermented about 6000–8000 years ago in the Middle East, while the first beer was brewed around 5000–6000 BCE by the Babylonians. The intoxicating ingredient of these drinks is ethanol, a by-product of bacterial fermentation, rather than secondary plant metabolites. Recent studies have shown that a low to moderate consumption of red wine is associated with reduction of mortality due to cardiovascular disease and cancer.

http://cms.herbalgram.org/herbalgram/issue101/HG101-EthnoBotWar.pdf

***Expanding Your Vocabulary*:**

BCE (BC) - year before the Christian Era
brew – beverage, drink, cocktail
CE - year of the Christian Era, year of the Current Era
consumption - the use of something; the utilization of economic goods in the satisfaction of wants or in the process of production resulting chiefly in their destruction, deterioration, or transformation
inebriant – winy, drunken; heady, intoxicants
kava - *Piper methysticum – Перец опьяняющий*
mortality – death; the proportion of deaths to population
nobility – elite, the high-born, grand people

THE VALUE OF PLANTS IN OUR LIVES

Ancient Man is known to have utilized plants as drugs for millennia. Based on current knowledge, at least in the West, we know that extracts of some of these plants are useful in a crude form, i.e. *Atropa belladonna* Tincture as an antispasmodic, *Rauvolfia serpentina* roots for hypertension and as a tranquilizer, *Papaver somniferum* extract or tincture as an analgesic, etc. Further, we know that at least 121 chemical substances of known structure are still extracted from plants that are useful as drugs throughout the world. A large number of plants are used in traditional medical practices, and have been for more than 3000 years, such as in Chinese Traditional Medicine, Indian Traditional Medicine, etc., most of which probably exert therapeutic effects and would be proven as such if they were properly evaluated by Western standards. Still further, plants have been employed for centuries by primitive cultures; most of these are less likely to pass the test of modern experimental verification of efficacy. Finally, there are a large number of so-called herbal remedies, mainly sold in health food stores in developed countries, many of which remain to be verified for their real therapeutic effects.

Several years ago the World Health Organization made an attempt to identify all medicinal plants that exist in the world. It was admitted that the compilation of names of medicinal plants undoubtedly contained many replicates since botanical verification was not attempted. Further, the list including more than 20,000 species only provided Latin binomials and the countries where the plants were used, but excluded data indicating what the plants were used for.

http://ebooks.cambridge.org/Global Importance of Medicinal Plants/chapter.jsf

Expanding Your Vocabulary

admit – declare, confess
attempt – effort, try
doubt - uncertainty hesitation
efficacy - usefulness, efficiency, effectiveness
exert - use, apply, utilize
remain - continue
remedies – medications, medicines, therapies, mixtures, preparations
replicate - duplicate copy repeat
tincture – solution, essence, mixture, extract
verification – confirmation, proof

⁎FORMIDABLE CHEMISTS⁎

Plants are fundamental to life. For millennia the plants, animals, rocks, and trees were the only pharmaceutical giants we had. Like all living things on Earth, every one of us is still a shareholder in Nature – the greatest pharmacy on Earth.

Plants are the most formidable chemists. They are constantly producing an arsenal of chemical compounds, in order to respond to different challenges and threats in their environment. They materialize chemical compounds that make them impervious to particular climatic conditions, certain microorganisms, bacteria, viruses, insects, numerous animals, including us.

We humans are still learning and re-learning how to harness the self-healing ability of plants, in order to enhance or rebalance the health of our own body, mind and spirit.

It is this ever expanding and evolving field of knowledge that inspires research and re-education. Throughout human history we have learned a lot from plants and we have continually endeavoured to pass this knowledge on to the next generation.

By Dragana Vilinac NYR Natural News

Expanding Your Vocabulary

endeavour- attempt, try
enhance – increase, improve, enrich, develop
evolve - change progress advance
formidable – puzzling, inspiring, interesting, exciting, challenging
harness - bind, connect
impervious – resistant, unaffected, hardy

⁎A WIDE RANGE OF PLANT USES⁎

The art of truly relating to the plants is to choose the ones that you feel an affinity with. If you have the ability to grow them for yourself – in a garden or in a pot – this is of enormous value. Growing your own plants and medicinal herbs, endeavouring to learn more about them put you in touch with Nature in a very deep way.

In the history of human kind we have never had so much information about medicinal nature of plants on our fingertips. The mystery of their magic still stands, but what was magic and mystery to our ancestors is a science to us today. The more we learn about plants the more we find ways to use them to support health. At a very basic level we can use them as a condiment or seasoning in food, enhance all those otherwise 'dull' dishes by the fragrance and flavour only herbs can provide. Where would tomatoes be without basil? How can a dish be Italian without a pinch of oregano? Strawberries are crying out to be partnered with lemon balm: 'If I am to be sacrificed to your feast let me be embalmed by the mint'.

The vibrant natural toiletries and cosmetics industry thrives on the power of plants to impart their healing, nourishing, soothing, invigorating, relaxing and other effects onto our skin and hair.

http://www.bgci.org/cultivate/article/390/

Expanding Your Vocabulary

affinity – attraction, sympathy
ancestor – predecessor, forefather
at one's fingertips - readily available
basil - *Ocimum basilicum* – Базилик священный
condiment - a spice, sauce or other food preparation that is added to foods to impart a particular flavor, enhance its flavor
embalm – preserve, protect, fix
enormous – huge, giant, massive, vast
feast – banquet, meal

fingertip - a protective covering for the end of a finger
fragrance – perfume, scent
invigorate – refresh, stimulate
lemon balm - *Melissa officinalis* – Мелиса лекарственная
mint – any of a family (*Labiatae,* the mint family) of aromatic plants used in flavoring and cookery
nourish - give food to
oregano - a perennial herb *Origanum vulgare* - Душица обыкновенная
pinch - to squeeze or press (something) together with your thumb and finger
put you in touch - to cause or help someone to communicate with someone or something
seasoning - the process of adding salt, herbs, or spices to food to enhance the flavor
thrive – flourish, boom, grow well
toiletries - cosmetic product, skincare product
vibrant – lively, energetic

PLANTS AS A BASIS OF SOME IMPORTANT DRUGS

Higher plants have been used as a source of drugs by mankind for several thousand years. In fact, ancient man was totally dependent on green plants for his day-to-day needs of medicaments. With the development of modern medicine, synthetic drugs and antibiotics, the importance of plants as raw material for drugs decreased considerably. However, plants were used as a basis of some of the most important drugs, even in the modern system of medicine. With the advancement of synthetic organic chemistry most of the active constituents of plants used in medicine were synthesized. At one time it was thought that ultimately all the plant drugs would be obtained from synthetic sources. However, in spite of phenomenal progress in the development of new drugs from synthetic sources and the appearance of antibiotics as major therapeutic agents, plants continue to provide basic raw materials for some of the most important drugs.

Although data are not available for all countries, a study carried out in the United States by Farnsworth and his colleagues between 1958 and 1980 indicated that although the number of prescriptions issued by community pharmacies in the United States increased considerably, the percentage of prescriptions containing one or more plant products remained constant at a figure of 25%. It has been found that in highly developed countries like the United States more than 100 chemical constituents of definite structure derived from 41 species of plants were used in modern medicine. It has also

been estimated that in addition to these active constituents, more than 96 crude extracts were also used in the United States.

http://ebooks.cambridge.org/Global Importance of Medicinal Plants/chapter.jsf

Expanding Your Vocabulary

constituent - component, basic
crude – basic, simple
prescription – drug, remedy, instruction, medicine, treatment
remain - continue
ultimately - eventually finally

⁎EXAMPLES OF SOME MODERN MEDICINE DISCOVERED FROM PLANTS⁎

Plants can provide biologically active molecules and lead structures for the development of modified derivatives with enhanced activity and reduced toxicity. The small fraction of flowering plants that have so far been investigated have yielded about 120 therapeutic agents of known structure from about 90 species of plants. Some of the useful plant drugs include vinblastine, vincristine, taxol, podophyllotoxin, camptothecin, digitoxigenin, gitoxigenin, digoxigenin, tubocurarine, morphine, codeine, aspirin, atropine, pilocarpine, capscicine, allicin, curcumin, artemesinin and ephedrine among others. In some cases, the crude extract of medicinal plants may be used as medicaments. About 121 (45 tropical and 76 subtropical) major plant drugs have been identified for which no synthetic one is currently available.

It has been estimated that more than 400 traditional plants or plant-derived products have been used for the management of type 2 diabetes across geographically. Galegine, a substance produced by the herb Galega officinalis, provides an excellent example of such a discovery. Experimental and clinical evaluations of galegine provided the pharmacological and chemical basis for the discovery of metformin which is the foundation therapy for type 2 diabetes.

Plant derived agents are also being used for the treatment of cancer. Several anticancer agents including taxol, vinblastine, vincristine, the camptothecin derivatives, topotecan and irinotecan, and etoposide derived from epipodophyllotoxin are in clinical use all over the world.

In conclusion, plants have provided humans with many of their essential needs, including life-saving pharmaceutical agents. Recently the World Health Organization estimated that 80% people worldwide rely on herbal medicines for some aspect. Many developing countries have intensified their efforts in documenting the ethnomedical data and scientific

research on medicinal plants. Natural products or natural product derivatives comprised 14 of the top 35 drugs in 2000 based on worldwide sales. There are more than 270,000 higher plants existing on this planet. But only a small portion has been explored phytochemically. So, it is anticipated that plants can provide potential bioactive compounds for the development of new 'leads' to combat various diseases. As a vast proportion of the available higher plant species have not yet been screened for biologically active compounds, drug discovery from plants should remain an essential component in the search for new medicines & the scientific study of traditional medicines, concerned medicinal plants are thus of great importance.

http://mdnasirahmed.wordpress.com/2011/12/30/medicinal-plants-their-importance-as-alternative-medicine/

***Expanding Your Vocabulary*:**

anticipate - do in advance, expect
combat – fight, struggle
crude – simple, rough, basic
derivative – copied, unoriginal; a chemical substance related structurally to another substance and theoretically derivable from it
yield – produce, harvest, profit

DID YOU KNOW?

- ✓ The word drug comes from the Dutch word "droog" which means ' dry' or 'to dry' which is in reference to how ancient healers and physicians would dry plants for use as medicines.
- ✓ The World Health Organization estimates that 80% of the world's population uses herbal medicine.
- ✓ 7,000 compounds used in modern medicine are derived from plants.
- ✓ One half of all medical schools now offer courses on alternative medicine, which includes the study of plants as medicine.
- ✓ One out of three medicines prescribed in Germany is an herb.
- ✓ On September 19, 1991, one of the most extraordinary discoveries of our Century took place in Austria's Otzal Alps, when two hikers discovered an ice mummy preserved by freezing. The analysis of samples of organic tissues has determined that the Iceman lived between 3350 and 3100 B.C. At death he was between 40 and 50 years old and suffered from a number of medical conditions. Among Ice Man's possessions there was his "medicine kit," containing a lump of a birch fungus used as a laxative and as a natural antibiotic.

PART II
MEDICINAL PLANTS & THEIR IMPORTANCE AS ALTERNATIVE MEDICINE

Never go to a doctor whose office plants have died.
Erma Bombeck

⁎INTRODUCTION TO MEDICINAL PLANTS⁎

A medicinal plant is any plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes, or which are precursors for chemo-pharmaceutical semi-synthesis. When a plant is designated as 'medicinal', it is implied that the said plant is useful as a drug or therapeutic agent or an active ingredient of a medicinal preparation. Medicinal plants may therefore be defined as a group of plants that possess some special properties or virtues that qualify them as articles of drugs and therapeutic agents, and are used for medicinal purposes.

There are a huge number of medicinal plants. In the US, almost 1800 medicinal plant species are commercially available. It has been estimated that about 13,000 species of plants have been employed for at least a century as traditional medicines by various cultures around the world. A list of over 20,000 medicinal plants has been published, and very likely a much larger number of the world's flowering plant species have been used medicinally. Sometimes the figure of 70,000 medicinal plant species is cited, but this includes many algae, fungi, and micro-organisms that are not really plants as the word is understood by botanists. In any event, there is no other category of plants useful to man (with the possible exception of ornamental plants) that includes so many species, and the question naturally arises why such a staggering number of plants have useful medicinal properties.

The use of medicinal plants is not just a custom of the distant past. Perhaps 90% of the world's population still relies completely on raw herbs and unrefined extracts as medicines. A 1997 survey showed that 23% of Canadians have used herbal medicines. In addition, as much as 25% of modern pharmaceutical drugs contain plant ingredients.

http://www.agr.gc.ca/eng/science-and-innovation/science-publications-and-resources/resources/canadian-medicinal-crops/introduction-to-medicinal-plants

***Expanding Your Vocabulary*:**

article – object, item, thing

designate – label, entitle, to be
imply – suggest, indicate
possess – have, own
precursor – ancestor; a substance, cell, or cellular component from which another substance, cell, or cellular component is formed especially by natural processes
staggering – amazing, shocking, surprising
virtue – quality, feature, advantage

⁎HISTORY OF PLANT BASED TRADITIONAL MEDICINE⁎

Plants have formed the basis of sophisticated traditional medicine (TM) practices that have been used for thousands of years by people in China, India, and many other countries. Some of the earliest records of the usage of plants as drugs are found in the Artharvaveda, which is the basis for Ayurvedic medicine in India (dating back to 2000 BCE), the clay tablets in Mesopotamia (1700 BCE), and the Eber Papyrus in Egypt (1550 BCE). Other famous literature sources on medicinal plant include "De Materia Medica," written by Dioscorides between CE 60 and 78, and "Pen Ts'ao Ching Classic of Materia Medica" (written around 200 CE).

Nowadays plants are still important sources of medicines, especially in developing countries that still use plant-based TM for their healthcare. In 1985, it was estimated in the Bulletin of the World Health Organization (WHO) that around 80 % of the world's population relied on medicinal plants as their primary healthcare source. Even though a more recent figure is not available, the WHO has estimated that up to 80 % of the population in Africa and the majority of the populations in Asia and Latin America still use TM for their primary healthcare needs. In industrialized countries, plant-based traditional medicines or phytotherapeuticals are often termed complementary or alternative medicine (CAM), and their use has increased steadily over the last 10 years. In the USA alone, the total estimated "herbal" sales rose to $6 billion - an increase of 7.9% over 2013, a significant increase from $4.4 billion in 2005. However, such "botanical dietary supplements" are regulated as foods rather than drugs by the United States Food and Drug Administration (US FDA).

*http://www.science20.com/news_articles/herbal_dietary_supplement_*

***Expanding Your Vocabulary*:**

sophisticated - highly developed and complex
TM - traditional medicines

termed – named, entitled

supplement – to add something extra in order to improve something or make it bigger

clay - a type of heavy wet soil that becomes hard when it is baked in a kiln (=oven), used for making cups, plates, and other objects

⁎TRADITIONAL USE⁎

All cultures have a history of herbal medicine use, usually making use of the plants found closest to home. Even today in the times of advanced technology and medical science still depend on plants for their healing. Western culture, however, is predominantly excited by the new and upcoming and the novel – and perhaps most importantly the patentable. This means that the good, tried and tested tools of survival become relegated to historical anecdote.

But herbal medicines – the original human health care products – are still fully present and available to our lives if you look out for them.

Common herbs and spices – including ginger, turmeric and garlic, and cinnamon and rosemary as well as fenugreek seeds and leaves, artichoke leaf extract, yarrow, and holy basil all may help lower cholesterol. For lowering blood pressure, herbs and spices including cloves, ground Jamaican allspice, cinnamon, sage, marjoram, tarragon, and rosemary are beneficial. Thyme tincture can outperform conventional acne treatments.

Until the beginning of 1900s medicinal plants from all over the world were fully monographed in all pharmacopoeias as legitimate medicinal ingredients. They are now presented in relatively small numbers but that is slowly changing as we rediscover the true medicinal value of plants. European laws continue to restrict not only what can be sold, but what can be said about traditional herbal remedies insisting on the randomised trial being the only source of legitimate information.

It is good, then, to see some scientists acknowledging that ancient investigation is research and that traditional use, or 'herbal lore' – as often passed down orally as in written form – can also help us understand the uses and relevance of herbs in our lives.

http://greendesert.org/Medicinal.html

Expanding Your Vocabulary

acne – spots, bad skin

artichoke - *Cynara cardunculus var. scolymus* - Артишок

fenugreek – *Frigonella foenum - graecum* – Пажитник греческий

cinnamon - a spice obtained from the inner bark of several trees from the genus *Cinnamomum* - корица

garlic – *Allium sativum* - Чеснок

ginger - *Zingiber officinale* - Имбирь

grind (ground – ground) - to crush or break (something) into very small pieces by rubbing it against a rough surface or using a special machine

herbal lore - knowledge about herbs gained through study or experience

Jamaican allspice - botanically-known as *Pimenta officinalis* - dried berry of the Jamaican pepper tree with a combined flavor of cinnamon, nutmeg, and cloves with a hint of juniper and peppercorn.

legitimate – real, accepted, or official, allowed according to rules or laws allowed according to rules or laws,

marjoram - *Origanum majorana* - Майоран

novel – fresh, innovative, unusual, unique

patentable - protected by a patent, protected by a trademark or a brand name so as to establish proprietary rights analogous to those conveyed by letters patent or a patent

randomize - to arrange or choose (something) in an accidental way or order

relegate - to put (someone or something) in a lower or less important position, rank, etc.

rosemary – *Rosmarinus officinalis* - Розмарин

sage - *Salvia* - шалфе́й

tarragon - *Artemisia dracunculus* - Эстрагон

Thyme – *Thymus vulgaris*) – Тимьян обыкновенный

tincture - a solution of a medicinal substance in an alcoholic solvent, an active principle or extract

turmeric - *Curcuma longa* - Куркума,

yarrow – *Achilléa millefólium* – Тысячелистник обыкновенный

⁎POTENTIAL VALUE OF TRADITIONAL MEDICINE⁎

Traditional medicine has been with the World Health Organization (WHO) for the last twelve years or so and for the rest of the world for the last several thousand years of recorded history. One might say that we are new at the game.

Traditional medicine is widespread throughout the world. It comprises those practices based on beliefs that were in existence, often for hundreds of years, before the development and spread of modern scientific medicine and which are still in use today. As its name implies, it is part of the tradition of each country and employs practices that have been handed down from generation to generation. Its acceptance by a population is largely

conditioned by cultural factors and much of traditional medicine, therefore, may not be easily transferable from one culture to another. In dealing with traditional medicine, WHO aims at exploiting those aspects of it that provide safe and effective remedies for use in primary health care.

Acknowledging its potential value for the expansion of health services, the World Health Assembly has passed a number of resolutions. In 1976, it drew attention to the manpower reserve constituted by traditional practitioners; it urged countries to utilize their traditional systems of medicine. In 1978, it called for a comprehensive approach to the subject of medicinal plants. This approach was to include:

- ❖ An inventory and therapeutic classification, periodically updated, of medicinal plants used in different countries;
- ❖ Scientific criteria and methods for assessing the safety of medicinal plant products and their efficacy in the treatment of specific conditions and diseases;
- ❖ International standards and specifications for identity, purity, strength and manufacturing practices;

http://ebooks.cambridge.org/Global Importance of Medicinal Plants/chapter.jsf

Expanding Your Vocabulary

acknowledge – recognize, admit, allow

assess - to determine the importance, size, or value of (something), to make an official valuation, to officially say what the amount, value, or rate of (something) is

comprise - to be made up of (something) : to include or consist of (something)

exploit - to get value or use from (something), to use (someone or something) in a way that helps you unfairly

imply - to express (something) in an indirect way : to suggest (something) without saying or showing it plainly

inventory - a complete list of the things that are in a place

practitioner - a person who works in a professional medical or legal business

urge - to ask people to do or support (something) in a way that shows that you believe it is very important, to try to persuade (someone) in a serious way to do something

widespread - widely extended, common over a wide area or among many people

⁎10 INTERESTING FACTS ABOUT COMPLEMENTARY AND ALTERNATIVE MEDICINE⁎

1. The World Health Organization estimates that between 65 to 80 percent of the world's population (over 4 billion people) rely on alternative medicine as their primary form of health care compared to only 10 to 30 percent of people who use conventional medicine.

2. Traditional Chinese medicine has been chosen by the World Health Organization for worldwide propagation to meet the heath care needs of the twenty-first century.

3. Medicinal herbs were found amongst the personal effects of the mummified prehistoric "ice man" who was found in the Italian Alps in 1991.

4. 19 percent of Fortune 500 companies offer alternative medicine as part of their health care compensation packages.

5. One-half of all medical schools now offer courses in alternative medicine.

6. Spinal manipulation was used by the Ancient Greeks long before it was incorporated into chiropractic and osteopathic medicine in the 19th Century.

7. More than 70% to 90% of physicians consider complementary and alternative medicine therapies, such as diet and exercise, behavioral medicine, counseling and psychotherapy, and hypnotherapy, to be legitimate medical practices.

8. Massage therapy dates back thousands of years and has been recorded in ancient writings from the Orient, Asia, Arabia and Greece.

9. The National Institutes of Health currently invests about $40 million per year in complementary and alternative medicine related research.

10. 2/3 of people who use complementary and alternative medicine do not tell their medical doctor.

http://www.vitalitylink.com/blog/holistic-health/10-interesting-facts-about-complementary-and-alternative-medicine/

***Expanding Your Vocabulary*:**

conventional – traditional, common; currently accepted, popular
spinal - back, vertebral

⁎ERBE⁎

The word herb is derived from the old French *erbe* and, from its first appearance in English in the late 13th century, meant both a plant without a woody stem and a plant of particular medicinal or culinary value. The "h" first appeared in the 15th century but wasn't voiced until the 19th century

(which is why Americans still refer to "erbs"). Any plant with officinalis in its Latin name can be used as a medicine.

Using plants to heal, soothe, and flavour food probably stretches back into prehistory, but one of the earliest documented uses of plants in a medicinal capacity is the Ebers Papyrus, which dates from 1,500 BC and was discovered in an Egyptian market in 1872 by a German called Georg Ebers. The papers contain more than 700 magical spells and herbal remedies that were in use for thousands of years, including garlic for digestive problems, poppy seeds for headaches and sesame seeds for asthma. The papyrus also suggests a herbal mixture of acacia, dates, colocynth and honey to prevent pregnancy.

http://www.telegraph.co.uk/men/the-filter/qi/9903199/QI-some-quite-interesting-facts-about-herbs.html

***<u>Expanding Your Vocabulary</u>*:**

appearance - a process of coming into existence or use:
headache – pain in the head
officinalis - curative; medicinal; beneficial; healthful; health-giving; medicamentary
pregnancy - the condition of a woman or female animal that is going to have a baby or babies
soothe – calm, quiet, relax

DID YOU KNOW?

- In 1571, when smoking was first introduced to Europe from the New World, the Spanish doctor Nicolás Monardes established tobacco's reputation as a cure for more than 20 ailments, including cancer.
- The Egyptians studied herbs and used them in medicinal and religious functions as far back as 3500 B.C. The Chinese began the organized study of herbs in 2500 B.C. Written records inChina have survived enumerating the uses of herbs that date from 100 B.C.
- The discovery of America itself is linked to Western civilization's search for easier access to rare spices and herbs. Columbus was, in fact, hoping to open trade routes for these substances when he blundered into the West Indies and the Age of Exploration unveiled the New World.
- Western medicine eventually turned away from "herbalism" and concentrated instead on chemical cures. It is interesting to note, however, that many of the chemicals and medicines that have been developed over the years are in fact based on active ingredients present in herbs and plants.

HERBAL

The first herbal, a book combining drawings of plants and descriptions of their healing properties, is another Egyptian papyrus. The Johnson Papyrus is a piece of a book, or scroll, from the fifth-century AD. The drawing is of a bluey-green plant which the Greek text below identifies as symphyton (comfrey). Unfortunately the illustration looks very unlike the real plant.

STREWERS

The first recorded Royal Herb Strewer was appointed in 1660. They walked through the royal residences, strewing a mixture of camomile, mint, sage, rue, lavender and roses to cover up the stench from the pipes and bring relief to the royal noses. By the time George IV came to the throne, improvements in hygiene had removed the need to fill the air with fragrance, so he appointed one Anne Fellowes to scatter flowers and herbs at his coronation. The job was passed down through the family: Anne's descendants (the Fellowes of Downton Abbey fame) still claim the title today.

SAGE

The absolute key medicinal herb of the ancient and medieval worlds was sage. Its Latin name salvia was cognate with the late Latin salvare, "to save", from which "salvage" and "safe" are also got). A punning Latin proverb ran: cur moriatur homo cui salvia crescit in horto? ("Why should a man die while sage grows in his garden?") it was matched by an English saying: "He that would live for aye, must eat Sage in May."

The herbalist John Gerard (1545-1611) gives a sense of its use as cure-all: "Sage is singularly good for the head and brain, it quickeneth the senses and memory, strengtheneth the sinews, restoreth health to those that have the palsy, and taketh away shaky trembling of the members." It is still used in herbal medicine and makes an excellent antiseptic mouthwash.

ROSEMARY

Another herb that was formerly used more for medicine than in the kitchen was rosemary. It was used to cure anxiety and bad dreams, insanity and impotence; washing with it was thought to be a good way to retain youthful looks. It was also used to dress the bodies of the dead. The French botanist Jacques-Christophe Valmont de Bomare (1731-1807) records that when coffins were opened, branches of rosemary that had been held in the corpse's hand had grown to cover the whole body.

POISON

Many herbs that would be considered poisonous under normal circumstances are still used in medicine today. Ingest just one leaf of common foxglove (*Digitalis purpurea*), and you could suffer from vomiting, severe headache, or even death; but extracts are used to control heart rates. Deadly nightshade (*Atropa bella-donna*) gives us atropine, used in the treatment of cardiac arrest. Bella donna is Italian for "beautiful lady" and originates from its use as a beauty product: an extract was used to make women's pupils dilate. Even the smallest dose of poison hemlock (*Conium maculatum*) can result in respiratory collapse, but it is used as a sedative and to stop spasms.

http://www.telegraph.co.uk/men/the-filter/qi/9903199/QI-some-quite-interesting-facts-about-herbs.html

***Expanding Your Vocabulary*:**

anxiety – nervousness, worry, unease
aye - a response accepting an order:
coffin – sarcophagus, box
cognate - having the same origin; of the same or similar nature
comfrey - *Symphytum* (*Boraginaceae)* – Окопник. Several species, in particular the common comfrey (*S. officinale*) - Окопник аптечный, which is used in herbal medicine
corpse - body
descendant - proceeding from an ancestor or source; a person, plant, or animal that is descended from a particular ancestor
hemlock - (*Conium maculatum*) - болиголов крапчатый
insanity – senselessness, irrationality, craziness
palsy - a medical condition that causes your body or part of your body to shake uncontrollably
pipe - a long, hollow tube for carrying water
punning – a joke exploiting the different possible meanings of a word
pupil - the contractile hole in the iris (the central part) of the eye
restore - bring back or re-establish; return (someone or something) to a former condition
retain – remember, recollect, keep in mind
rue – pity, regret, feel sorry about
scatter - cover (a surface) with objects thrown or spread randomly over it
scroll - a roll of parchment or paper for writing on; an ancient book or document written on a scroll.
sinew - a piece of tough fibrous tissue uniting muscle to bone

stench - a strong and very unpleasant smell:
strew - scatter or spread (things) untidily over a surface or area
symphyton – *see* comfrey

⁎INTERESTING TRUTHS AND FACTS ABOUT HERBAL REMEDIES⁎

Herbal remedies are the use of plants or plant extracts to medicate certain illnesses, minor or serious illnesses even cancer treatment. It has been used by our ancestors historically - the Chinese, Arabs, Africans for centuries. According to the World Health Organization, "traditional medicine is the sum total of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures that are used to maintain health, as well as to prevent, diagnose, improve or treat physical and mental illnesses."

Fact Number 1

The effectiveness of herbal medicine is not corroborated by scientific evidences but it is continually used by almost 80 percent of people in other parts of the world like Asia and Africa and Arab nations.

Fact Number 2

In some parts of the world specifically the United States herbal remedies are classified as dietary supplement because it can't either be classified as food or drugs. Laws pertaining to dietary supplements are relatively lax comparing to drugs or foods.

Fact number 3

The World Health Organizations stated that "Not many countries have national policies for traditional medicine. Regulating traditional medicine products, practices and practitioners is difficult due to variations in definitions and categorizations of traditional medicine therapies. A single herbal product could be defined as either dietary supplement food or an herbal medicine, depending on the country. This disparity in regulations at the national level has implications for international access and distribution of products."

Fact Number 4

The availability of herbs and herbal products in some countries is a problem that is why it is difficult to standardized it.

Fact Number 5

Culture plays an important part whether to use herbal remedies or not. Availability of immediate herbal remedies is also a factor in using them.

Fact Number 6

In some countries, there are well defined rules and laws pertaining to herbal medicines as well as professionals who are certified to practice "the scientific study of herbals", case in point is China where there are medical doctor who are giving prescriptions pertaining to herbals.

Fact Number 7

The people in the oldest civilization used herbal remedies to treat diseases specially the Chinese, Arabs and Africans as evidence into eh different writings. It has been fact that herbal medicine is prevent o be effective even in history.

Fact Number 8

About the safety and effectiveness plus quality: The World health Organization also stated that: the "Scientific evidence from tests done to evaluate the safety and effectiveness of traditional medicine products and practices is limited. For example, it can be difficult to assess the quality of finished herbal products. The safety, effectiveness and quality of finished herbal medicine products depend on the quality of their source materials (which can include hundreds of natural constituents), and how elements are handled through production processes."

Putting all this information together it is up to the individual whether to medicate with herbal remedies or not. As they say health is wealth and since herbal remedies have been proven historically not scientifically, it is a nice alternative as herbal is natural and it comes from nature as well. In the same manner as there should always be precaution, we should talk to a physician first if we have doubts about herbal remedies especially if we are taking medicines for other sickness. Like in scientific medicine, there is always risk in taking medicines whether it is herbal or scientific medicines which are artificial. Scientific medicines are artificial and taken in by our body in the same manner as herbal remedies are provided by nature.

http://alexandriaruthk.hubpages.com/hub/Are-Herbal-Remedies-Safe-Interesting-Truths-and-Facts-About-Herbal-Remedies

***Expanding Your Vocabulary*:**

artificial - non-natural, synthetic, imitation
evidence – indication, sign, suggestion, proof

indigenous – native, original, aboriginal
lax – careless, negligent
pertain – relate, affect, belong to
precaution – safeguard, insurance, security
supplement – addition, extra

DID YOU KNOW?

- The use of herbal medicines predates human history.
- The first medical schools were based on the use of plants and herbs.
- About 5000 traditional remedies are available in China; they account for approximately one fifth of the entire Chinese pharmaceutical market.
- After the Black Death, the use of plants as medicines was replaced with the use of more toxic chemical substances, like heavy metals (mercury, lead, arsenic, etc…). Especially after the science of chemistry evolved, the use of plants as medicine was replaced with the allopathic system in most industrialized countries.
- Herbal seeds have been found in pre-historic cave dwellings dating as old as 500,000 years. Our ancestors have always used herbs as food and as remedies.
- Many herbal remedies found their way from China into the Japanese systems of traditional healing, herbs native to Japan being classified in the first pharmacopoeia of Japanese traditional medicine in the ninth century
- Ayurveda is a medical system primarily practised in India that has been known for nearly 5000 years. It includes diet and herbal remedies, while emphasizing the body, mind and spirit in disease prevention and treatment

PART III

CLASSIFICATION OF MEDICINAL PLANTS

"The land abounds in these natural remedies and to classify the plants, give their names and describe their properties, the presence of a botanist would be required. It is certain that many illnesses are cured by people and they have their remedies for everything, many quite effective. For this reason not a few prefer their herbs and roots to our unguents and salves."

Reply by a missionary at Mission San Antonio as to what knowledge the natives had of medicines

⁎INTRODUCTION⁎

Classification of medicinal plants is organized in different ways depending on the criteria used. In general, medicinal plants are arranged according to their active principles in their storage organs of plants, particularly roots, leaves, flowers, seeds and other parts of plant. These principles are valuable to mankind in the treatment of diseases. Reports on the classification of many plant species yielding vegetable oils used in cosmetics and body and skin care preparations are sporadic or lacking. Herbs are classified in many ways. Some of them are:

1. according to the usage;
2. according to the active constituents;
3. according to the period of life;
4. according to their taxonomy;
5. according to their habitats.

***Expanding Your Vocabulary*:**

arrange – organize, assemble, place
lacking – missing, absent
sporadic – irregular, periodic
unguents – an oily substance that is put on the skin or a wound
abound – to be present in large numbers or in great quantity
salves - a medical cream that you spread on sore skin to reduce the pain
preparations - the process of making someone or something ready for something; a mixture that has been made especially for use as a medicine, food, or treatment for your skin

⁎ CLASSIFICATION ACCORDING TO THE USAGE ⁎

The herbs are classified in four parts: ***medicinal herbs, culinary herbs, aromatic herbs, ornamental herbs***.

A. Medicinal Herbs have curative powers and are used in making medicines because of their healing properties like marigold, lemon balm, lavender, johnny-jump-up, feverfew etc.

B. Culinary Herbs are probably the mostly used as cooking herbs because of their strong flavours like oregano, parsley, sweet basil, horseradish, thyme etc.

C. Aromatic Herbs have some common uses because of their pleasant smelling flowers or foliage. Oils from aromatic herbs can be used to produce perfumes, toilet water, and various scents. For e.g. mint, rosemary, basil etc.

D. Ornamental Herbs are used for decoration because they have brightly coloured flowers and foliage like lavender, chives, bee balm, lemongrass etc.

http://www.rd.com/slideshows/herbs/

***<u>Expanding Your Vocabulary</u>*:**

curative – healing, therapeutic, medicinal, health-giving
foliage – vegetation, greenery, leaves
johnny-jump-up – Heartsease - *Viola tricolor* - *Фиалка трёхцветная/ Анютины глазки*
scents – aromas, odors, smells

⁎ CLASSIFICATION ACCORDING TO THE ACTIVE CONSTITUENTS ⁎

According to the active constituents all herbs are divided into five major categories: ***Aromatic*** (volatile oils), ***Astringents*** (tannins), ***Bitter*** (phenol compounds, saponins, and alkaloids), ***Mucilaginous*** (polysaccharides), and ***Nutritive*** (food stuffs).

A. Aromatic Herbs

The name is a reflection of the pleasant odour that many of these herbs have. They are used extensively both therapeutically and as flavourings and perfumes.

Aromatic herbs are divided into two subcategories: ***stimulants*** **and** ***nervines***.

- ***Stimulant Herbs*** increase energy and activities of the body, or its parts or organs, and most often affect the respiratory, digestive, and circulatory systems. E.g. fennel, ginger, garlic, lemongrass.
- ***Nerving Herbs*** are often used to heal and soothe the nervous system, and often affect the respiratory, digestive, and circulatory systems as well. They are often used in teas or in encapsulated form, e.g. ginger, catnip.

B. Astringent Herbs

Tannins in Astringent Herbs have the ability to precipitate proteins, and this "tightens," contracts, or tones living tissue, and helps to halt discharges. They affect the digestive, urinary, and circulatory systems, and large doses are toxic to the liver. They are analgesic, antiseptic, ant abortive, astringent, emmenagogue, hemostatic, and styptic. For e.g. peppermint, red raspberry.

C. Bitter Herbs

Bitter Herbs are named because of the presence of phenols and phenol glycosides, alkaloids, or saponins, and are divided into four subcategories: ***laxative herbs, diuretic herbs, saponin containing herbs,*** **and** ***alkaloid-containing herbs.***

- ***Laxative Bitter herbs*** include alterative, ant catarrhal, antipyretic, cholagogue, purgative, hypotonic, sialagogue, vermifuge, and blood purifier. For e.g. aloe, cascara, liquorice, pumpkin, senna, yellow dock, yucca, barberry, gentian, safflowers, and golden seal.
- ***Diuretic Herbs*** induce loss of fluid from the body through the urinary system. The fluids released help cleanse the vascular system, kidneys, and liver. They are alterative, antibiotic, ant catarrhal, antipyretic, and antiseptic, lithotripter, and blood purifier in nature. For e.g. asparagus, blessed thistle, burdock, butcher's broom, buchu, chaparral, chickweed, corn silk, dandelion, dog grass, grapevine, and parsley.
- ***Saponin-containing Herbs*** are known for their ability to produce frothing or foaming in solution with water. The name "saponin" comes from the Latin word for soap. They emulsify fat soluble molecules in the digestive tract, and their most important property is to enhance the body's ability to absorb other active compounds. Saponins have the ability to effectively dissolve the cell membranes of red blood cells and disrupt them. They are alterative, ant catarrhal, antispasmodic, and aphrodisiac, emmenagugue, cardiac stimulant, and increased longevity in nature. For e.g. yam root, schizandra, black cohosh, blue cohosh, devil's claw, liquorice, alfalfa, yucca, ginseng, and gotu kola.

D. Mucilaginous Herbs

Mucilaginous herbs derive their properties from the polysaccharides they contain, which give these herbs a slippery, mild taste that is sweet in water. All plants produce mucilage in some form to store water and glucide as a food reserve. They eliminate the toxins from the intestinal system, help in regulating it and reduce the bowel transit time. They are antibiotic, antacid, demulcent, emollient, vulnerary, and detoxifier in nature. For e.g. althea, aloe, burdock, comfrey, dandelion, Echinacea, fenugreek, kelp, psylium, slippery elm, dulse, glucomannan from Konjak root, Irish moss, and mullein.

E. Nutritive Herbs

These herbs derive both their name and their classification from the nutritive value they provide to the diet. They are true foods and provide some medicinal effects as fibber, mucilage, and diuretic action. But most importantly they provide the nutrition of protein, carbohydrates, and fats, plus the vitamins and minerals that are necessary for adequate nutrition. For e.g. rosehips, acerola, apple, asparagus, banana, barley grass, bee pollen, bilberry, broccoli, cabbage, carrot, cauliflower, grapefruit, hibiscus, lemon, oat straw, onion, orange, papaya, pineapple, red clover, spirulina, stevia, and wheat germ.

http://ocw.upm.es/ingenieria-agroforestal/medicinal-and-aromatic-plants/syllabus

***Expanding Your Vocabulary*:**

alterative - a drug used empirically to alter favorably the course of a disease

antipyretic - used to prevent or reduce fever.

astringent - causing the contraction of skin cells and other body tissues

calculi - a concretion usually of mineral salts around organic material found especially in hollow organs

cholagogue - an agent that promotes an increased flow of bile (a yellow or greenish viscid alkaline fluid secreted by the liver)

disrupt - the act or process of breaking apart

emmenagogue - a substance that stimulates or increases menstrual flow.

encapsulate - enclose (something) in a capsule

frothing – bubbling, fermenting

induce – encourage, persuade

kidney – each of a pair of organs in the abdominal cavity of mammals, birds, and reptiles, that excrete urine.

lithotripter - a device for performing lithotripsy; especially: a noninvasive device that pulverizes calculi by focusing shock waves on a patient immersed in a water bath

liver - a large very vascular glandular organ of vertebrates that secretes bile and causes important changes in many of the substances contained in the blood which passes through it

mucilage - a jellylike substance of various plants (as legumes or seaweeds) that contains protein and polysaccharides and is similar to plant gums

mucilaginous - relating to, resembling, containing, or secreting mucilage

odour – smell, aroma

purgative - strongly laxative in effect.

sialagogue - an agent/ drug that promotes the flow of saliva, watery liquid secreted into the mouth by glands, providing lubrication for chewing and swallowing, and aiding digestion.

slippery – slick, oily, fatty, smooth

styptic - a substance capable of causing bleeding to stop when it is applied to a wound.

tighten - stiffen, tense, firm, hard to move

vermifuge - an anthelmintic medicine used to destroy parasitic worms.

volatile - unstable

* CLASSIFICATION ACCORDING TO THE PERIOD OF LIFE *

Herbs also can be classified as ***annuals, biennials,*** **and** ***perennials*****.** Annuals bloom one season and then die. Biennials live for two seasons, blooming the second season only. Once established, perennials live over winter and bloom each season. They can last for many years with proper care.Annual herbs complete their life cycle in one year; start them from seed. The annuals have to be seeded each year unless conditions are favorable enough in the garden to seed themselves.

Annual herbs include: Anise, Basil, Borage, Calendula (Pot Marigold), Chamomile, Chervil, Cilantro/ Coriander, Dill Bouquet, Dill Dukat, Fennel smoky, Marjoram, Parsley, Saffron, Summer Savoury.

Perennial herbs grow for more than one season and include sweet marjoram, parsley, mint, sage, thyme and chives. Most can be started from young plants. Perennial herbs include: Alfalfa, Allspice, Aloe Vera, Angelica, Bee Balm, Bay leaves, Catnip, Chives Common, Lavender, Lemon Balm, Mints (Spearmint, peppermint, apple mint, orange mint), Mitsuba,

Oregano, Rosemary, Sorrel, Salad Burnet, Sage, Tarragon, Thyme, Watercress, Yarrow.

Biennial are plants which live two season and bloom in the second season only. They are Caraway seeds, Prime rose, Bai Zhi, Mullein, Teasel, Viper's Bugloss.

Like all other plants, herbs can be propagated from seeds, cuttings, divisions, and to a lesser degree, layering.

http://ocw.upm.es/ingenieria-agroforestal/medicinal-and-aromatic-plants/syllabus

***Expanding Your Vocabulary*:**

bloom - produce flowers; be in flower

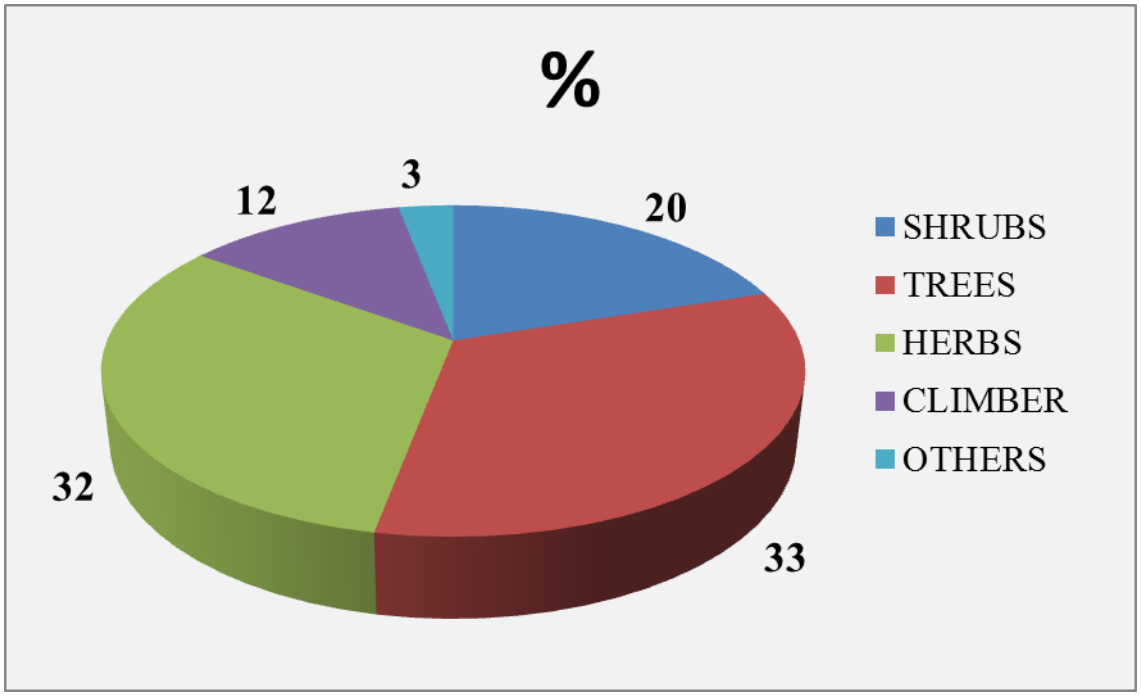
cutting - a stem, leaf, or root that is cut from a plant and used to grow a new plant

division - one of the parts or groupings into which a whole is divided; plant propagation by dividing parts and planting segments capable of producing roots and shoots

layering - a branch or shoot of a plant that roots while still attached to the parent plant; a method of propagating a plant in which a shoot is fastened down to form roots while still attached to the parent plant.

lesser - of less size, quality, degree, significance, status

*** DISTRIBUTION OF MEDICINAL PLANTS BY HABITATS ***



The Earth has many different environments, varying in temperature, moisture, light, and many other factors. Each of these habitats has distinct life

forms living in it, forming complex communities of interdependent organisms. A complex community of plants and animals in a region and a climate is called a biome.

* BOTANICAL CLASSIFICATION OF MEDICINAL PLANTS MODERN BOTANICAL NOMENCLATURE *

A system to distinguish plants which is based purely on common names would be both ambiguous and confusing, and could group together plants which bear similar names, but are not related to each other e.g. here are some listings for Laurel (Mabberley 1998):

- Alexandrian Laurel *Calophyllum inophyllum* L.
- Bay Laurel *Laurus nobilis* L.
- Californian Bay Laurel *Umbellularia californica* (Hook. & Arn.) Nutt.
- Cherry Laurel *Prunus laurocerasus* L.
- Chinese Laurel *Antidesma bunius* (L.) Sprengel etc. etc.

So, today, plants are classified under the binomial system invented by Carl Linnaeus (1707 - 1778), a Swedish botanist. In this system, the first name given is the genus, whereas the second is the specific epithet e.g. for: creeping or Corsican mint is known as *Mentha requienii Bentham*, its genus is Mentha and its specific epithet is requienii. In this genus, there are 25 species including M. requienii and therefore the binomial l ('two stages naming') system gives a precise classification of the particular plant.

Botanists have further developed this system into a comprehensive diversely branched family tree of classifications, which includes all known plants. The complete ascending sequence is ***species, genus, family, order, class and division***. The meaning of the botanical name may be indicative of the history of the plant i.e. a genus may be named after a particular botanist e.g. the Kaempferia, is named after the German physician Englebert Kaempfer 1651-1716. The name may also tell something of the habit or morphological characteristics of the plant e.g. in Gaultheria procumbens L., the latter name derives from 'procumbent' which describes the plant's habit.

http://herbarium.usu.edu/teaching/4420/botnom.htm

***<u>Expanding Your Vocabulary</u>*:**

ambiguous – unclear, uncertain, indefinite
ascending - rising or increasing to higher levels, ranks, values, or degrees
distinguish – differentiate, separate
invent – discover, develop, design, create

particular – specific, certain, individual
precise – exact, accurate, detailed
procumbent - being or having stems that trail along the ground without rooting
sequence – order, arrangement, structure

* THE RULES OF PLANT NOMENCLATURE *

The rules pertaining to plant nomenclature have been set out in two publications: 1) The International Code of Nomenclature for Cultivated Plants (first edn 1952 – the latest 6th edn. being published in 1995); 2) The International Code for Botanical Nomenclature (latest "the Tokyo Code: 1993).

Plants are divided into families in which similarly related plants are grouped together basic on the clear similarity of morphological characteristics. ***Families*** may contain one genus or a large number. ***A genus*** may similarly contain one species or a large number of related individuals – for example the Rosmarinus genus contains just two species, Rosmarinus eriocalix Jord. & Fourr. and R. officinalis L. (although some workers recognise Rosmarinus tomentosus Huber-Morath & Maire, as a third species of the genus). Variations occur within a species and these are accommodated in the following manner: ***a subspecies*** (ssp.) is a distinct variant often arising because of evolution of plant ***form*** from geographic factors, ***varieties*** (var.) have small differences in morphology, and the form (forma), has very minor differences e.g. leaf or fruit colour. ***Cultivars*** offer further evidence of diversity and according to The International Code of Nomenclature for Cultivated Plants (1980), cultivars named since 1959 should be given vernacular names, which should be in roman type within quotes e.g. "Rosa".

Hybrid plants arising from the sexual crossing of distinct species within the same genera are called interspecific hybrids and are indicated by a multiplication sign e.g. Lavandin plants Lavandula x intermedia are sterile hybrids between Lavandula angustifolia Mill. and Lavandula latifolia Medic. Less commonly met are plants arising from sexual crossings between different genera (intergeneric hybrids). Grafting one plant onto another can also produce hybridised plant growing onwards from the grafting point: these are indicated by a + sign linking the two involved species.

Chemotypes (ct.) are of especial interest in the world of essential oils. These are marked by differences in products of secondary metabolism (e.g. essential oil composition) which can occur even in morphologically stable species, such as Chamomilla recutita (L.) Rauschert. For example, four chemotypes of Ocimum sanctum L. from the highly varied Ocimum genus

were described by Hegnauer (1966): a citral-type, a eugenol type, a methyl chavicol type and a chavibetonal type. The distinguishing criteria for chemotype identification are the major components only of the essential oil from a named specific part of the plant (seeds, leaves etc.).

Genetic control of essential oil biosynthesis has been investigated and a bank of knowledge now exists for specific oil-bearing plants. It is probable however that many chemotypes of common aromatic plants have yet to be properly identified.

http://herbarium.usu.edu/teaching/4420/botnom.htm

***Expanding Your Vocabulary*:**

grafting – joining; combining or integrating smth. with smth.; a shoot or branch implanted into a cut on the trunk or stem of a living plant, from which it receives sap

investigate – examine, explore, study

pertaining – affecting, relating, connect to

sign – symbol, mark

vernacular – dialect, colloquial speech; applied to a plant or animal in the common native speech as distinguished from the Latin nomenclature of scientific classification

*** FAMILIES OF THE MEDICINAL PLANTS ***

Most of the medicinal plants belong to the following families:

- ***Compositae***
- ***Labiatae***
- ***Umbelliferae***
- ***Boraginaceae***
- ***Cruciferae***

A. Medicinal plants of the Compositae family

The Compositae family, also known as the Daisy family, contains the highest number of medicinal plants as compared to other families, all members being sunlovers. They have either a disk flower or a ray flower. Being dry and hard the fruits often have plumes of hairs to aid in wind dispersal. Medicinal plants belonging to this family include chamomile, field and pot marigolds, daisy, wormwood, chicory, thistles, ragwort and artichoke.

B. Medicinal plants of the Labiatae family

A very important medicinal plant family is the Labiatae family, also known as the mint family. Plants in this family are herbs or shrubs often with

an aromatic smell. They are often met in the Mediterranean countries for the fact that some of them produce a high amount of essential oil that enables them to survive the hot summer season. The common characteristics are square stems and mostly irregular two-lipped flowers having four stamens. The fruit is small with four s (seeds). Some examples from this family include horehound, lavander, balm, micromeria, the mints, thyme and rosemary, basil, sage.

C. Medicinal plants of the Umbelliferae family

The Umbelliferae or parsley members often have hollow stems and flowers in clusters called *umbels* and a characteristic umbrella-arranged fruit. These plants usually produce an essential oil, an asset to survive during the hot summer days.

Bullwort (*Ammi majus*), wild celery (*Apium graveolens*), wild carrot (*Daucus carota*), sea holly (*Eryngium maritima*), fennel (*Foeniculum vulgaris*), anise (*Pimpinella anisum*), wild parsley (*Petroselinium crispum*) are all parsley family members.

D. Medicinal plants of the Boraginaceae family

The Boraginaceae or borage family is made up of herbs or small shrubs with bristly stems and leaves. Members of the Boraginaceae all have tubular flowers mostly in curved racemes, five stamens being attached to the tube. The ovary is superior usually forming a fruit composed of four nutlets. Examples in this family include borage (*Borago officinalis*), common comfrey (*Symphytum officinale*), purple alkanet (*Anchusa asurea*), yellow gromwell (*Neatostema apulum*), viper's bugloss (*Echium vulgare*) and southern hound's tongue (*Cynoglosum creticum*).

E. Medicinal plants of the Cruciferae family

The Cruciferae or mustard (cress) family is characterised by plant that have flowers with cross-like petals. This family groups a large group of medicinal plants that include Wallflower (*Cheiranthus cheiri*), Bitter cress (*Cardamine hirsuta*), Black mustard (*Brassica nigra*), Horseradish (*Armoracia rusticana*), Hedge mustard (*Sisymbrium officinale*), White mustard (*Sinapis alba*), Wild radish (*Raphanus raphanistrum*), Watercress (*Nasturtium officinale*).

There are some other families of plant to which herbs belong such as ***Rosaceae*** family, ***Rutaceae*** and ***Solanaceae*** families, ***Malvaceae*** and other families.

http://ocw.upm.es/ingenieria-agroforestal/ medicinal-and-aromatic-plants/ classification.pdf

***<u>Expanding Your Vocabulary</u>*:**

asset – advantage, benefit, plus

cluster – bunch, group
dispersal – spreading, distribution
nutlet - a small fruit similar to a nut
petal - one of the modified often brightly colored leaves of the corolla of a flower
plume - something resembling a feather (as in shape, appearance, or lightness)
raceme - a flower cluster with the separate flowers attached by short equal stalks at equal distances along a central stem. The flowers at the base of the central stem develop first.
stamen - the male fertilizing organ of a flower
tubular - tube-shaped, cylindrical

DID YOU KNOW?

- Botanical nomenclature is independent of zoological and bacteriological nomenclature. If an organism is considered to be a plant, then it must be named in accordance with the Botanical Code.
- The name of a species is **ALWAYS** a binomial. 'Grandiflora' is not the name of a species. It has to be combined with a generic name to form the name of a species, as in *Magnolia grandiflora*.
- Subspecies is a higher rank than variety. A subspecies may include several varieties. In practice, most taxonomists nowadays use one rank or the other, but not both.
- Europeans tend to use subspecies and expect subspecies to occupy somewhat different areas whereas Americans use variety to denote plants that are different from the plants first put in the species. The two ranks are used almost interchangeably
- Every plant belongs to a species, every species to a genus, every genus to a family, every family to an order, every order to a class, every class to a division (also called a phylum nowadays - a concession to the greater number of zoologists in the world). This is the taxonomic hierarchy.
- The names of all ranks from subgenus up **MUST** be capitalized.
- In most instances, the specific epithet - and epithets for lower rankings, must **NOT** be capitalized.
- Before a name, even a name that has a Latin form, can be accepted as a scientific name, it must satisfy several criteria. Some of these have to

do with its form, others with how its existence and meaning are made known to others.

RANK	ENDING	EXAMPLES
division (phylum)	-phyta	Pinophyta, Magnoliophyta
class	-opsida	Pinopsida, Liliopsida, Magnoliopsida
order	-ales	Pinales, Liliales, Magnoliales
family	-aceae	Pinaceae, Liliaceae, Magnoliaceae
tribe	-eae	Pineae, Lilieae, Magnolieae
genus	a noun	*Pinus, Lilium, Magnolia*
species	depends	*Pinus flexilis,Lilium grandiflorum, Magnolia grandiflora*
variety	depends	*Pinus flexilis var. humilus*
form	depends	

- There are two main types of Tarragon. The French has a strong flavour and the Russian is milder and much less aromatic. Tarragon is the correct flavouring for an authentic Tartare Sauce. Other names for this herb are "Little Dragon" and "Mugwort".
- The Greeks called Chamomile "ground apple", because of the particular apple scent of the flower. Not only is chamomile beneficial to the health of humans, but it is thought to promote a healthy garden too. An ailing plant is thought to recover if a chamomile is placed by it. Benefits to humans are as a natural sedative, a cure for gout, and a cure for many digestive ailments.
- "Tulsi" is the Hindi name for Basil, and it means "Sacred Basil"; in Greece the word for Basil means Royal. The Thai variety of Basil adds a great flavour to Thai green curry paste and in Italy Basil is the main flavouring of pesto. It is also a fantastic addition to tomato sauces and dishes.

PART IV

LIST OF MEDICINAL PLANTS

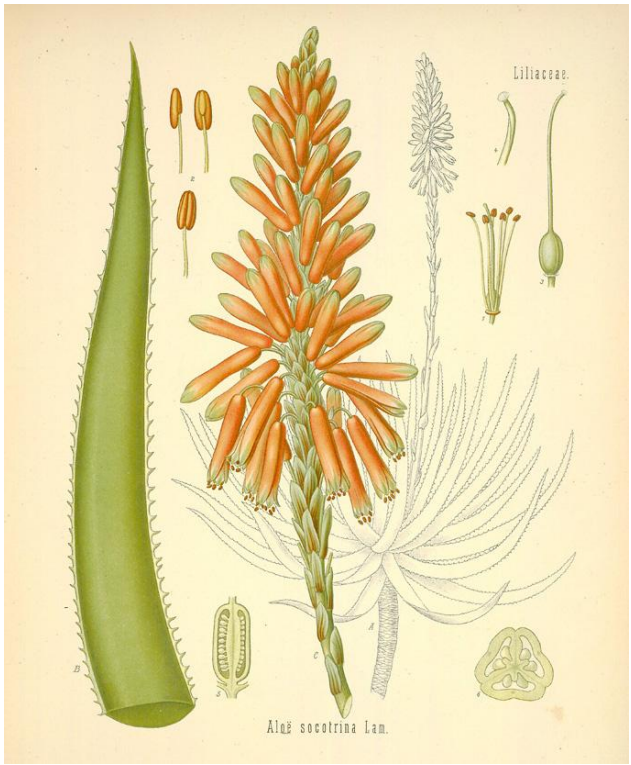
'Hot lavender, mints, savory, marjoram;
The marigold, that goes to bed wi' the sun,
and with him rise weeping.'

Shakespeare, Winter's Tale

As Rosemary is to the Spirit, so Lavender is to the Soul.
Anonymous

A LITTLE EASY STUDY OF HERBS AND HERBAL SUPPLEMENTS

⁎ALOE⁎



Botanical: *Aloe vera* (L) Burn, *Aloe ferox* Mil.
Family: Liliaceae
Part Used: Leaves.
Habitat: Aloes are indigenous to East and South Africa, but have been introduced into the West Indies (where they are extensively cultivated) and into tropical countries, and will even flourish in the countries bordering on the Mediterranean.

The sap from aloe vera is extremely useful to speed up the healing and reducing the risk of infections. It can be used against sunburn, kitchen burns, and other skin irritations. In a juice form, aloe vera is used against ulcerative colitis, constipation, and other digestive diseases. Aloe can be got by simply breaking off leaves of the plant (which can be grown as a houseplant), but it is also available commercially in ointments, creams, and lotions. Aloe gel is often included in cosmetic and

over-the-counter skin care products as well. Aloe can be purchased in the form of capsules, tablets, juice, gel, ointment, cream, and lotion.

ANISE

Botanical: *Pimpinella anisum* L.
Family: Umbelliferae
Part Used: Seeds.
Habitat: It is a native of Egypt, Greece, Crete and Asia Minor and was cultivated by the ancient Egyptians. It was well known to the Greeks, being mentioned by Dioscorides and Pliny and was cultivated in Tuscany in Roman times. In the Middle Ages its cultivation spread to Central Europe. The commercial varieties differ considerably in size.
Anise is well known as a carminative and an expectorant. Its ability to decrease bloating and settle the digestive tract still is used today, especially in pediatrics. In high doses, it is used as an antispasmodic and an antiseptic and for the treatment of cough, asthma, and bronchitis. Research reveals no clinical data regarding the use of anise as an expectorant or as an antimicrobial. Anise is also used as a flavouring for soups.

The oil extracted from the seed is said to prove capital bait for mice, if smeared on traps. It is poisonous to pigeons.

MARIGOLD

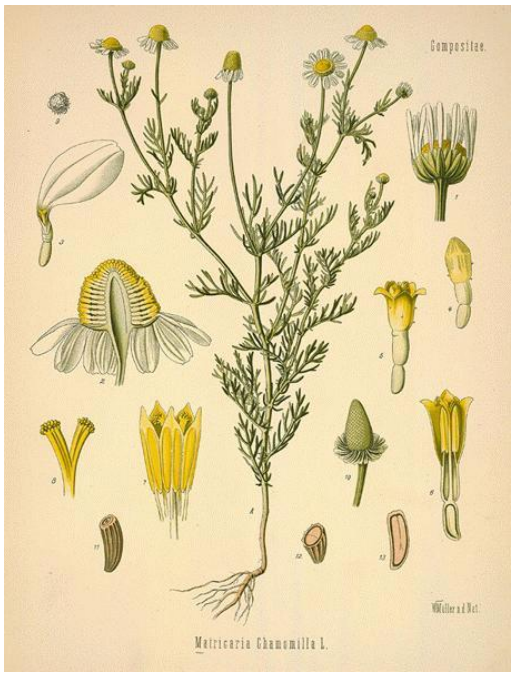
Botanical: *Calendula officinalis* L.
Family: Compositae
Synonyms: Ruddes. Pot Marigold.
Parts Used: Flowers, herb, leaves.
Calendula is believed to be native to Egypt and has almost worldwide distribution. The plant has been grown in European gardens since the 12th century.
The pot marigold grows in almost any type of soil condition. It has no problem with

nutritionally poor, very acidic or very alkaline soils, just as long as it's moist. It is well known as a remedy for skin problems and the tea of the petals are supposed to tone up circulation and if taken regularly, eases varicose veins. It is also said that by applying the crushed stems of the pot marigold to corns and warts makes them easily removable.

Tinctures and extracts of the florets are used topically to promote wound healing and to reduce inflammation. Taken orally, they have been used to reduce fever, control dysmenorrhea, and treat cancer.

Calendula products should always be protected from light and moisture, and should not be used after 3 years of storage.

⁎CHAMOMILE



Chamomile, Common
Botanical: Chamomila recutita (L.) Rauschert
Family: Compositae
Synonyms: wild chamomile, scented mayweed
Habitat: There are a number of species of Chamomile spread over Europe, North Africa and the temperate region of Asia.
Parts Used: The whole plant is odoriferous and of value, but the quality is chiefly centred in the flower-heads or capitula, the part employed medicinally, the herb itself being used in the manufacture of herb beers.

No plant was better known to the country folk of old, it having been grown for centuries in English gardens for its use as a common domestic medicine to such an extent that the old herbals agree that 'it is but lost time and labour to describe it.'The Egyptians reverenced it for its virtues, and from their belief in its power to cure ague, dedicated it to their gods.

When walked on, its strong, fragrant scent will often reveal its presence before it is seen. For this reason it was employed as one of the aromatic strewing herbs in the Middle Ages, and used often to be purposely planted in green walks in gardens. Indeed walking over the plant seems specially beneficial to it. 'Like a camomile bed - The more it is trodden The more it will spread,' The aromatic fragrance gives no hint of its bitterness of taste.

Chamomile has a soothing and calming effect in the area of aromatherapy, used to end stress and aid in sleep. It can also be used for a

number of ailments, including a cold, diarrhea, earache, toothache, digestive disorders, eczema, and common wounds.

COLTSFOOT

Botanical: *Tussilago farfara* L.
Family: Compositae
Synonyms*:* Coughwort. Hallfoot. Horsehoof. Ass's Foot. Foalswort. Fieldhove. Bullsfoot.
Parts Used: The leaves, collected in June and early part of July, and, to a slighter extent, the flower-stalks collected in February.
Habitat: Coltsfoot grows abundantly along the sides of railway banks and in waste places, on poor stiff soils, growing as well in wet ground as in dry situations.

Coltsfoot is used to treat sore throats, asthma, and some related conditions such as bronchitis, laryngitis, pertussis, influenza, and lung congestion.

An old name for Coltsfoot was Filius ante patrem (the son before the father), because the star-like, golden flowers appear and wither before the broad, sea-green leaves are produced.

DANDELION

Botanical: *Taraxacum officinale* Web.
Family: Compositae
Synonyms: Priest's Crown. Swine's Snout.
Parts Used*:* root, leaves.
Habitat: Though not occurring in the Southern Hemisphere the Dandelion is at home in all parts of the north temperate zone, in pastures, meadows and on waste ground, and is so plentiful that farmers everywhere find it a troublesome weed, for though its flowers are more noticeable in the earlier months of the summer, it may be found in bloom, and consequently also prolifically dispersing its seeds, almost throughout the year.

Dandelion is used for its nutritional value in addition to other uses including diuresis, regulation of blood glucose, liver and gall bladder disorders, appetite stimulation, and for dyspeptic complaints.

A chemical compound known as helenin which is found in the flowers of the dandelion may be the cure for those with a problem of reduced vision in the dark - night blindness, usually treated using large doses of vitamin A.

Dandelion wine

4 cups (250 g) dandelion flowers picked around noon on a sunny day
2 untreated lemons (without the juice)
2 untreated oranges (without the juice)
15 g white wine yeast, dry
16 cups (4 liters) boiled water
3 lbs (1.5 kg) honey (dandelion honey, if possible)

Pour the boiling water on the flowers. Dilute the honey in the mixture. Cut the citrus fruit into cubes and add to the mixture. Allow to ferment in an earthenware jar or in a large glass pitcher in a dark location at 68 F degrees (20 C degrees) for 3 weeks and stir with a large wooden spatula every 2 to 3 days. When fermentation completes, strain using a clean cheesecloth. Bottle the wine and seal with a cork. Age in a cool area for 9 months.

This wine is excellent for the gallbladder, for treating gout and uric acid, and is highly recommended for a prediabetic condition.

⁎ECHINACEA⁎

Botanical: *Echinacea angustifolia* DC.
Family: Compositae
Synonyms*:* Black Sampson. Coneflower.
Parts Used*:* root, dried; also rhizome.
Habitat: America, west of Ohio, and cultivated in Britain.
Echinacea can be planted in a front or backyard because the flower is very pleasing to the eye.

The echinacea grows on any well drained soil, as long as it gets sunlight.

It has the capacity to raise body's resistance to bacterial and viral infections. It is also used to strengthen the immune system in fighting allergies when steeped in water. And the roots are beneficial in the treatment of sores, wounds and burns.

ELECAMPANE

Botanical: *Inula helenium* L.
Family: Compositae
Synonyms: Scabwort, Elf Dock, Wild Sunflower, Horseheal, Velvet Dock,
Part Used: root.
Habitat: It is found widely distributed, though can scarcely be termed common, occurring only locally, in damp pastures and shady ground.

Elecampane is one of our largest herbaceous plants. It was cultivated for centuries as a medicinal plant, being a common remedy for sicknesses in the Middle Ages.

Elecampane is used for lung diseases including asthma, bronchitis, and whooping cough. It is also used to prevent coughing, especially coughing caused by tuberculosis. Other uses include improving stomach function; treating nausea and diarrhea; and killing worms that can live in the intestine.

In foods and beverages, elecampane is used to provide flavor. In other manufacturing processes, elecampane is used as a fragrance in cosmetics and soaps.

FENNEL

Botanical: *Foeniculum vulgare* Gaertn.
Family: Umbelliferae
Synonyms: Fenkel. Sweet Fennel. Wild Fennel.
Parts Used: Seeds, leaves, roots.
Habitat: most parts of temperate Europe, but it is generally considered indigenous to the shores of the Mediterranean, whence it spreads eastwards to India. It may be found growing wild in many parts of the world upon dry soils near the sea-coast and upon river-banks. It flourishes particularly on limestone soils.

Fennel is a hardy, perennial, umbelliferous herb, with yellow flowers and feathery leaves. For the medicinal use of its fruits, commonly called

seeds, Fennel is largely cultivated in the south of France, Saxony, Galicia, and Russia, as well as in India and Persia. Fennel is used as a flavoring agent, a scent, and an insect repellent, as well as an herbal remedy for poisoning. It is also used as a stimulant to promote lactation and menstruation. However, clinical evidence to support the use of fennel for any indication is lacking

GINGER

Botanical: *Zingiber officinale* Roscoe
Family: Zingiberaceae
Part Used: Root.
Habitat: Said to be a native of Asia. Cultivated in West Indies, Jamaica, Africa. Naturalized in America after the discovery of that country by the Spaniards. It is now cultivated in great quantities in Jamaica and comes into this country dried and preserved.
Ginger is an herbal product. It works by neutralizing stomach acid. It also has anti-inflammatory properties. Ginger is used for: upset stomach, motion sickness, and nausea.

Other uses include pain relief from arthritis or muscle soreness, menstrual pain, upper respiratory tract infections, cough, and bronchitis. Ginger is also sometimes used for chest pain, low back pain, and stomach pain. The root from the West Indies is considered the best.

HORSETAIL

Botanical: *Equisetum arvense* L.
Family: Equisetaceae
Synonyms: Shave-grass. Bottle-brush. Paddock-pipes.
Part Used: Herb. The above ground parts.
Habitat: It is chiefly distributed in the temperate northern regions. It is a very troublesome weed, most difficult to extirpate from cultivated land. Many of the species are very variable.

Horsetail (Equisetum arvense) is an herbal remedy dating back to ancient Roman and Greek medicine.

In general, the horsetail plant grows in grasslands that are moist. Swampy soil is often a favorite of the plant. Despite this fact, the horsetail plant is highly adaptable and grows in many types of different conditions, including particularly dry climates. The plant can adapt easily by its leaf size decreasing, which saves water. Horsetail plant prefers either partial shade or sun.

Horsetail contains silicon, which plays a role in strengthening bone. For that reason, it is sometimes suggested as a treatment for osteoporosis.It is also used as a diuretic, and as an ingredient in some cosmetics. However, very few studies have looked at horsetail's effect in humans.

Similar to most nutritional supplements, horsetail is secure when taken short term (just for a maximum of two months), and in moderation.

PEPPERMINT

Botanical: *Mentha piperita* L.
Family: Labiatae
Synonym: Brandy Mint.
Part Used: Herb.
Habitat: The plant is found throughout Europe, in moist situations, along stream banks and in waste lands, and is not unfrequent In America it is probably even more common as an escape than Spearmint, having long been known and grown in gardens.

Among essential oils, Peppermint ranks first in importance. The chief constituent of Peppermint oil is Menthol, but it also contains menthyl acetate and isovalerate, together with menthone, cineol, inactive pinene, limonene and other less important bodies. Peppermint oil is the most extensively used of all the volatile oils, both medicinally and commercially. The characteristic anti-spasmodic action of the volatile oil is more marked in this than in any other oil, and greatly adds to its power of relieving pains arising in the alimentary canal.

Peppermint is good to assist in raising internal heat and inducing perspiration, although its strength is soon exhausted. In slight colds or early indications of disease, a free use of Peppermint tea will, in most cases, effect a cure. Peppermint is naturally high in manganese, vitamin A and vitamin C. Crushed leaves rubbed on the skin help soothe and relax the muscles. Infused peppermint leaves are used to reduce irritable bowel syndrome, against upset

stomachs, to treat fevers and flatulence. Putting crushed leaves in boiling water is used as an air freshener and an inhalant to loosen phlegm.

It's also a flavoring.

OREGANO

Botanical: *Origanum vulgare* L.
Family: Labiatae
Synonym: Mediterranean oregano, Mexican oregano, mountain mint, wild marjoram, winter marjoram, wintersweet.

This super herb is very rich in anti-oxidants and a natural source for Omega-3 fatty acids. It can be used as a disinfectant, and an aid for throat/ respiratory infections as well as digestion.

Oregano is a great source for vitamin E & K, calcium, iron and fiber. It can be used as dried seasoning or the leaves can just be added to salads.

Aside from its culinary application, oregano exhibits antimicrobial and antioxidant actions and has possible activity as an antispasmodic and in diabetes. However, there is no clinical trial evidence to support the use of oregano for any indication.

⁎LAVENDER⁎

Botanical: *Lavandula angustifolia* Mill.
Family: N.O. Labiatae
Synonym: common lavender, English lavender.
Habitat: It is a shrubby plant indigenous to the mountainous regions of the countries bordering the western half of the Mediterranean, and cultivated extensively for its aromatic flowers in various parts of France, in Italy and in England and even as far north as Norway.

It is also now being grown as a perfume plant in Australia. Lavender grows best in a well-drained garden area or pot that receives plenty of sunlight.

Lavender oil has many uses. Rubbed into the skin, it can relax muscles and be used as aromatherapy. Crushed lavender flowers and drops of the oil can be brewed into a tea that helps the body to relax and sleep. The flowers have also been used to treat digestive problems, insomnia, anxiety, and restlessness. It can also be used as a disinfectant and insect repellant.

Lavender has been used for restlessness, insomnia, anxiety, diabetes, distress, perineal discomfort following childbirth, chemoprevention, as an insect repellant, and as a food flavoring agent. However, there are limited clinical trials to support any therapeutic use for lavender.

NETTLE

Urtica dioica, often called common nettle or stinging nettle. The taxonomy of Urtica species has been confused, and older sources are likely to use a variety of systematic names for these plants. Formerly, more species were recognised than are now accepted. There are at least six clear subspecies of U. dioica, some formerly classified as separate species.

Parts Used: Herb, seeds.

Habitat: Urtica dioca is abundant in northern Europe and much of Asia, usually found in the countryside. It is less widespread in southern Europe and north Africa, where it is restricted by its need for moist soil. In North America it is widely distributed in Canada and the United States, where it is found in every province and state except for Hawaii.

Nettle is used for: hay fever symptoms, including sneezing and itching; urinary tract infections; kidney stones; and to increase urination. It also claims use as a remedy for premenstrual bloating and excessive menstrual bleeding.

The whole herb is collected in May and June, just before coming into flower, and dried in the usual manner prescribed for 'bunched' herbs.

Nettle use is claimed to help relieve the early symptoms of benign prostatic hypertrophy. It may also have other uses. Extracts of Urtica dioica leaves may help with glycemic control in type 2 diabetes patients that need to use insulin.

⁎PLANTAIN⁎

Botanical: *Plantago major* L.
Family: Plantaginaceae
Synonyms: Broad-leaved Plantain. Ripple Grass. Waybread. Waybroad. Snakeweed. Cuckoo's Bread. Englishman's Foot. White Man's Foot.
Parts Used: Root, leaves, flower-spikes.
Habitat: The Common Broad-leaved Plantain is a very familiar perennial 'weed,' and may be found anywhere by roadsides and in meadow-land.
The psyllium in plantain has been used as Gastrointestinal therapy, to treat hyperlipidemia for anticancer effects, respiratory treatment, and other uses. Plantain leaves have been given as a tea for cold and cough.
Contraindications have not yet been identified.

⁎VALERIAN⁎

Botanical: Valeriana officinalis L.
Family: Valerianaceae
Part Used: Root.
Habitat: Europe and Northern Asia.
Valerian does well in all ordinary soils, but prefers rich, heavy loam, well supplied with moisture.

Valerian is a flowering plant, the root of which is dried and used as an herbal remedy. Valerian has been used in alternative medicine as an aid to treat sleep problems, anxiety, and mood disorders.

The chief constituent of Valerian is a yellowish-green to brownish-yellow oil, which is present in the dried root to the extent of 0.5 to 2 per cent though an average yield rarely exceeds 0.8 per cent. The root also contains two alkaloids - Chatarine and Valerianine - which are still under

investigation. There are also a glucoside, alkaloid and resin all physiologically active.

Valerian is a powerful nervine, stimulant, carminative and antispasmodic.

In the Middle Ages, the root was used not only as a medicine but also as a spice, and even as a perfume. It was the custom to lay the roots among clothes as a perfume.

MORINGA TREE

It is a plant native to the sub-Himalayan areas of India, Pakistan, Bangladesh, and Afghanistan. It is also grown in the tropics. The leaves, bark, flowers, fruit, seeds, and root are used to make medicine. Moringa has been identified as the vegetable with the highest nutritional value among many types of food species studied.

Tolerant of drought and poor soil and fast growing, the moringa tree (*Moringa oleifera*) is a living miracle. Almost every part of the tree from the roots to the flowers is beneficial. It can be harvested as food, used for forage for animals, and made a water purifier, fertilizer, or a variety of traditional medicines. This is truly a miracle plant.

http://healthymanners.com/wp-content/uploads/2012/05/Moringa-value.jpg

Moringa can act as cardiac and circulatory stimulants, possess antitumor, antipyretic, antiepileptic, antiinflammatory, antiulcer,

antispasmodic, diuretic, antihypertensive, cholesterol lowering, antioxidant, antidiabetic, hepatoprotective, antibacterial and antifungal activities, and are being employed for the treatment of different ailments in the indigenous system of medicine.

WHEATGRASS

Although wheatgrass is not a herb it has incredible medicinal purposes. It increases red blood-cell count and lowers blood pressure. It cleanses the blood, organs and gastrointestinal tract of debris. Wheatgrass also stimulates metabolism and the body's enzyme systems by enriching the blood and aids in reducing blood pressure by dilating the blood pathways throughout the body.

Wheatgrass is primarily used as a concentrated source of nutrients. It contains vitamin A, vitamin C, and vitamin E, iron, calcium, magnesium, and amino acids. Wheatgrass juice is a popular health drink. It is thought to benefit health only when fresh and taken on an empty stomach immediately after extraction. But there is no research to date that supports this.

In foods and beverages, wheatgrass extracts are used as a flavoring component.

Wheatgrass is very easy to grow. In fact it only takes about a week to grow to a length ready for juicing.

http://www.wheatgrasscan.com/why-easyphamax/features/cultivation

***LEMON-SCENTED TEA TREE –**
(LEPTOSPERMUM PETERSONII)*

Utility friendly tree. Evergreen shrub to small tree with lemon scented leaves which can be used as a tea substitute. Leaves and stems contain essential oils used in candle and soap making.

Botanical: Leptospermum petersonii
Family: Myrtaceae
Synonyms: Tea Tree, Lemon-Scented Tea Tree
Native To: Eastern Australia
Habit: erect, spreading or weeping
Shape: oval or rounded
Water Needs: moist to dry and well drained soil.
Soil Type: loam or sand; slightly acidic to slightly alkaline.

The tea tree was named by eighteenth century sailors, who made tea that smelled like nutmeg from the leaves of the tree growing on the swampy southeast Australian coast. Do not confuse the tea tree with the unrelated common tea plant that is used to make black and green teas.

Even the Aborigines have been using the tea tree leaves for medicinal purposes, like chewing on young leaves to relieve headaches. The leaves and twigs, eventually made into tea tree oil, is anti-fungal, antibacterial, and antiseptic. Tea tree oil can be used in home-made cleansers and to treat several conditions including thrush, vaginal infections, acne, insect bites, cold sores and minor burns.

Some people add it to bath water to treat cough, bronchial congestion, and pulmonary inflammation.

***Expanding Your Vocabulary*:**

ague - a fever (as malaria) marked by paroxysms of chills, fever, and sweating that recur at regular intervals

carminative - a drug relieving flatulence (the accumulation of gas in the alimentary canal)

constipation - a condition in which there is difficulty in emptying the bowels, usually associated with hardened faeces

cough - to force air through your throat with a short, loud noise often because you are sick

dysmenorrhea - painful menstruation

expectorant - a medicine which promotes the secretion of sputum by the air passages, used to treat coughs.

reverence – admiration, deep respect for someone or something, regard or treat with deep respect:

sap - the fluid which circulates in the vascular system of a plant, consisting chiefly of water with dissolved sugars and mineral salts.

ulcerative - to become affected with or as if with an ulcer (a painful, sore area inside or outside the body)

virtues – qualities, features, advantages

wart - a small, hard lump on the skin caused by a virus

strew - a hot bath; to boil slowly or with simmering heat

trap - a device or enclosure designed to catch and retain animals, typically by allowing entry but not exit or by catching hold of a part of the body:

smear - *medical*: a very small sample of something (such as skin or blood) that someone examines with a microscope; Spread (a greasy or sticky substance) over something:

bait - food used for attracting and catching fish, birds, or animals

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DID YOU KNOW?

- *RECIPE FOR HYSSOP TEA*
  'Infuse a quarter of an ounce of dried hyssop flowers in a pint of boiling water for ten minutes; sweeten with honey, and take a wineglassful three times a day, for debility of the chest. It is also considered a powerful vermifuge.' (Old Cookery Book.)
- New compounds, such as one recently discovered in a plant in Madagascar, are likely to provide novel antibiotics and help curb the epidemic of antibiotic-resistant diseases.
- Plant-derived anti-cancer drugs such as taxol, first isolated from the Pacific yew, save at least 30,000 lives per year in the United States.

- Herbs are trophorestorative, which means they work on the deepest level to bring about vitality and healing. It has been found, through scientific research, that plants benefit us by actually transferring information to our bodies on a genetic level. Now, that's called deep healing!
- According to old wives' tales, borage was sometimes smuggled into the drink of prospective husbands to give them the courage to propose marriage."
- Water is the mother of tea, a teapot its father, and fire the teacher. ~Chinese Proverb
- Tea began as a medicine and grew into a beverage. ~Okakura Kakuzō
- Drinking a daily cup of tea will surely starve the apothecary. ~ Chinese Proverb
- Tea is a divine herb. ~Xu Guangqi
- From the narrowest possible point of view, it is in the best interests of mankind to minimize the losses of genetic variations. The reason is simple: they are potential resources. They are keys to puzzles which we cannot solve, and may provide answers to questions which we have not yet learned to ask.
- Utility-friendly trees are small, reaching 25 feet or less at maturity. Such trees do not grow into, and thus interfere with, power lines; consequently they may not conduct electricity making the tree dangerous, even potentially fatal. Such trees planted under utility lines don't require regular pruning by the utility company that is costly and results in an unnatural and unhealthy tree form. Utility-friendly trees are a safe solution to potential conflicts between power lines and urban trees. Utility-friendly trees contribute to the urban forest in many of the same ways that larger trees do by providing shade, spring flowers, fall color and habitat for wildlife. Tall trees that have grown into the utility
- Most of the medicinal plants are not infected with diseases, however. If they are infected, try to cure them using indigenous practices or biopesticides. Try to avoid use of chemical pesticides/herbicides.

PART V

CULTIVATION AND MANAGEMENT OF MEDICINAL PLANTS

With rake and seeds and sower,
And hoe and line and reel,
When the meadows shrill with "peeping"
And the old world wakes from sleeping,
Who wouldn't be a grower
That has any heart to feel?

Frederick Frye Rockwell
"Invitation," Around the Year in the Garden, 1913

WHY TO CULTIVATE MEDICINAL PLANT?

All cultures from ancient times to the present day have used medicinal plants which are still harvested from the wild. Little by little consumers have increasingly demanded more both quality and supply of medicinal plants (MPs). Nowadays, direct collection from the wild supposed a risk for many MPs survival in its natural habitats. Therefore, it is recommended to ensure their conservation, a suitable MPs cultivation and a regulation of their collection from the wild.

The main reasons to cultivate medicinal plants are:

Quality tests and products homogenization: purchasers of raw material (dry or fresh material), such as herbal industry or laboratories are more demanding with MPs quality. If the herb is purchased by herbal industry, homogenization and visual test are required. If material is purchased by laboratory, as well as, it is required homogenization and even active constituent richness and purity in the case of essential oil.

Conservation of local species and its natural habitat: Thyme, rosemary, lavender, labdanum, bearberry, Gentian are collected from the wild. Among of them it is currently selling at no sustainable volume, which is leading to depletion and destruction of their natural habitat. Some of them, such as Gentian (*Gentiana lutea*), Bearberry (*Arctosthaphyllos uva-ursi*), bogbean (*Menyanthes trifoliata*) and Arnica (*Arnica montana*), are in a critical state, so it is necessary to take serious conservation action.

In addition, the implementation of MPs in agriculture land should be taking into account as a real alternative in land with poor benefits. According to future guidelines for ***Common Agriculture Policy*** (CAP) which are aimed to reducing surpluses crop production, MPs cultivation could be an alternative and suitable extensive agriculture. On the other hand, during centuries MPs have being very well adapted to hard Mediterranean climate conditions, especially dryness and poor nutritional soil. It is pointed out that many aromatic, medicinal and seasoning plants belong to local native Mediterranean species.

http://ocw.upm.es/ingenieria-agroforestal/industrial-utilization-of-medicinal-plants/

***Expanding Your Vocabulary*:**

ancient – antique, prehistoric, earliest
depletion – reduction, exhaustion, lessening
guideline – recommendation, advice, instruction
homogenization - the act or process of homogenizing (to change (something) so that its parts are the same or similar)
implementation – application, execution, putting into practice
purchase – buy, acquisit
purity – cleanliness, lack of dirty or harmful substances
surpluse – extra, excess
survival – existence; the state or fact of continuing to live or exist especially in spite of difficult conditions
sustainable - able to be used without being completely used up or destroyed; workable, maintainable
volume – size; the amount of space occupied by a three-dimensional object as measured in cubic units (as liters)

⁎CULTIVATION TECHNICQUES⁎

Cultivation characteristic depends on the water needs of individual medicinal plant species, which can be classified as drought tolerant plant (thyme, rosemary) and demanding water plant (Mint, balm lemon). In addition, cultivation technical also depends on the final product target (leaves, whole plant, dry herb, essences and frozen herb). Therefore water supply, orientation, altitude are limiting factors.

Plants can be cultivated by direct seeding or planting. Seeding reduce plantation cost and space requirement, whereas planting is a successful application for low germination rate in plants, such as Labiatae family, and a way to control weeds as well as. In dry land, planting density is around

twelve and fifteen plants per hectare, although in irrigated land it may be twice more. Planting density also depends on plant structure and harvest and processing machinery.

In fertilization, plants with big biomass are more demanding in nitrogen, but Labiatae family are less demanding and even an nitrogen excess can produce more weakness and less active constituents in plant. Before plantation it is recommended fertilization with manure or mature compost.

Only a little irrigated land is able to provide medicinal plants for household needs, for example in 20 meter square. The plantation season should start from August to November.

http://ocw.upm.es/ingenieria-agroforestal/industrial-utilization-of-medicinal-plants/

***Expanding Your Vocabulary*:**

density – concentration, compactness, thickness
household – family; the people in a family or other group that are living together in one house
target – aim, goal

⁎SELECTION OF SPECIES⁎

Selection of species is undoubtedly linked to the future success of the exploitation. It is necessary not only to take into account climate and soil requirement but also available equipment, workforce and facilities, so as the maximal yield and efficiency will be able to reach.

Therefore it is necessary to find the optimal balance among the following data: a) market requirements; b) field characteristic/ features; c) species requirements in its cultivation, its processing, available and suited equipment such as farm machinery, facility and workforce.

⁎*MARKET REQUIREMENT*⁎

Industry determined the kind of specie that it is admitted. The plant production can lead to pharmacy, herbal industry, cosmetics and perfumery, and finally nutritional industry. In pharmaceutical laboratories, the most demanded species are valerian, bearberry, St John's wort, Milk thistle, Opium poppy, Meadow saffron. In herbal industries mint, peppermint, lemon balm, chamomile, lavender, salve, thyme are required. In cosmetics and perfumery lavender, mint, chamomile, rose, aloe Vera, arnica are of great importance. Nutritional or seasoning industry is interested in laurel (bay tree), rosemary, mint, gencian, parsley, sweet basil and juniper.

⁎*CULTIVAR FIELD FEATURES*⁎

Water supply

It is especially important to choose the right place for the cultivation of a given culture and to irrigate it properly by not allowing the formation of swamps or stagnant waters. Medicinal plants cannot be cultivated in heavy and water-retaining soils. According to water supply, different kinds of land can be found:

High water supply: irrigated land (sprinklers) or big volume of rainfall

Low water supply: dry land (trickle irrigation)

Dry zones are the most suited for the cultivation of Medicinal and aromatic plant. The quality and richness of essential oils is better in dry land than in irrigated land; for instance, lavender, thyme, and rosemary and St John's wort. In addition, we can also have good yield in cumin, fennel, and aniseed.

In irrigated land, it can be cultivated more number of species, such as mint, basil, peppermint, valerian and especially when it is necessary the whole plant, either their leaves or its root.

Altitude

Average altitude restricts the number of species. Altitude has a double effect on plants: firstly temperature decreased as a rate (dry adiabatic lapse rate or wet adiabatic lapse rate) of around one degree C per 200m of altitude (-1 ºC/200m) and secondly it can affect the active constituents concentration. It has been proved that high altitude increases rancidness of active constituents such as Gentian and also decreases the richness of active constituents in mint and thyme.

Plants which can be adapted to grow in high altitudes are valerian, angelica, mint, sweet balm, St John's wort, Great burdock, Cone flower.

Low altitude, especially under Mediterranean influence, is very suited for cultivating species such as thyme, salve, lavender and rosemary because it is extracted essential oil with more quality and better yield.

Climate condition

Climate condition also plays an important role in the election of species. When choosing the climate one should take into consideration the duration of daylight, the amount of rainfalls and the temperature range. These factors together with the day and night temperature amplitudes directly affect the physiological and biochemical processes in plants, especially the ones

which involve enzyme reactions. These factors will inevitably influence their growth and the synthesis of organically active substances.

Medicinal plants require different climatic conditions to grow depending on their natural origin. These conditions need to be identical or at least similar to the conditions of their natural habitats. If one ignores climate, it is quite possible that yields would be very low and the percentage of active substances – much reduced. Most medicinal plants require sunny, aerated places sheltered from strong winds and late winter frosts.

It is also recommended that rooted species should be cultivated in sandy, deep and light soil; for instance Great burdock, St John's wort, arnica, Gentian, valerian, dandelion.

As soon as, all data have been assessed and species have been chosen, the next step to be provided is vegetal material and cultivation technical and specific farm machinery and finally processing of harvested material.

http://ocw.upm.es/ingenieria-agroforestal/industrial-utilization-of-medicinal-plants/

***Expanding Your Vocabulary*:**

adiabatic - occurring without loss or gain of heat
admit – acknowledge, declare, confess
altitude - height
doubt – hesitation, uncertainty
lapse – interval, space, gap, pause
rancidness - having a abundant smell or taste
stagnant – still, motionless, immobile
suit - be convenient for or acceptable to; be proper; to provide what is required or wanted by or for (someone or something)
swamp – wetland, marsh, bog
trickle – drop

CULTIVATION TASK

All cultivation tasks are sure to be divided into:

- weed control/ blind cultivation
- fertilization

Weeds can be removed mechanically in row cultivation by using rod weeder, disking whereas weeds should be removed by hand pulling, hoeing within the row, especially if it is organic agriculture. If it is conventional agriculture it can be applied some authorized standard herbicides, carrying out the stipulated dose and frequency. During the first year of cultivation and until rows are not closed, weed control is necessary. During the second year

of cultivation, weeds control may reduce until third part. It is used straw cover or bark for reducing weeds control. Medicinal plants are not very nutrients and demanding but it is very important to carry out a fertilizing program. A peak in production plant has been illustrated in Sweet balm and Mint field, after winter fertilization.

Fertilization is also a task that needs a special attention. In spite of being low nutrient demanding plant, it is recommended to apply nutrients (mineralise) that have been removed during the crop, to avoid soil depletion. Fertilization is very helpful after plant coppicing, because plant springs stronger and healthier. Yield crop is increasing for any species under irrigated condition, although it should be taken into account that some species don't tolerate excess of moisture in soil or damp condition, for instance Salve.

It may be difficult to cultivate Sweet balm, mint and borage without irrigation. The most recommended is localized irrigation by dripper, sprayer or micro-sprinkler because a small discharge of water is applied for each plant. However, it is the most demanding in management.

http://ocw.upm.es/ingenieria-agroforestal/industrial-utilization-of-medicinal-plants/

***Expanding Your Vocabulary*:**

blind – visionless, unseeing
conventional – traditional, conservative
coppice - an area of woodland in which the trees or shrubs are periodically cut back to ground level to stimulate growth and provide firewood or timber:
damp – moist, humid, wet
depletion – reduction, exhaustion
discharge – release, liberation
hoe - a garden tool that has a flat blade on a long handle used especially for cultivating, weeding, or loosening the earth around plants
rod - a straight, thin stick or bar, especially of wood or metal:
spring – (sprang or sprung) - to grow as a plant
stipulate – require, demand, specify

PLANTATION CHARACTERISTICS

After selecting the most suited species, according to all mentioned aspects such as climate, soil condition and plant requirement, the following step is planning density plantation and space requirement. Therefore, the planning should take into account: a) harvesting and processing machinery;

b) plant requirement; c) available workforce during cultivation and following processing

The main target is maximized: equipment and facilities. Therefore it is recommended to plant species which have different blossoming stage or at least harvest and processing season doesn't occur at the same time. Spring is a stressful moment because harvest season is starting for thyme, oregano, Sweet balm, Mint, Save, St John's worn, basil. It is also recommended to test and analyse the soil and water not only to know initial field situation and fertility rate, but also to plan better plant requirement and future production.

In plantation establishment, it can be used the next vegetal material:

Seeding: is only suitable for species with a high germination rate. Seeds are collected after summer and then covered with a fine layer of soil. For instance, direct seeding in field for aniseed, calendula, parsley, valerian.

Seedling: comes from bare-root or container stock (in nursery), for instance Mint, Sweet balm, lavender, save, thyme, St John's wort, rosemary, fennel, ajedrea.

Transplant from wild plant: for instance passion flower, borage, nettle, common mallow.

Coppicing mother plant: young buds are extracted with a little root, for instance Mint.

Sprout propagation: young branch around 30 cm, below a nude. After cutting leaves, sprout is buried around 70 percent. For instance, rosemary, save, etc

Selecting one or another method depends on the kind of cultivation, whether is a conventional or organic agriculture. The latest mentioned, organic agriculture, involves in employing all the preventive methods to control weeds (especially when they compete with our plants). For this reason, it is recommended to use seedling for successful plantation establishment, as well as preparing soil before cultivation.

According to *period of life*, plants can be classified as annuals, biennials and perennials. Annual plant can spring from its ***underground seeds*** if they are not removed. It is advisable to group species in sector, taking care that each species have enough space to develop itself and then keeping the soil covered with straw. Previously brush and weeds have been removed.

Another important criterion is the *ecological behaviour* of the species. In addition, farmer should take into account seed viability, germination capacity and species hybridization to select one or another method to propagate material vegetal, such as seeding or seedling.

Price of vegetal material affects directly to cost of plantation establishment, for instance seeds can cost from 15 to 80 euros per kilogramme and prices of a plant are around five cents of euros per unit.

Plantation density depends on the plant species and field conditions. It is used an initial stocking rate (density) from 4 to 7 kg/ ha for seeding. The plantation density is linked to length of plant and cultivation conditions.

Planting density is usually in simple or multiple rows, according to size of plants and machinery. Density (plants per hectare) depends on plant species and supply of water, either dry land or irrigated land. It can be used a density of 14,000 or 15,000 plants of lavenders and salvia per hectare. It can be used a density of 45,000 pl/ ha for species such as thymes or ajedrea in irrigated land.

Plantation can be programmed in spring or in autumn according to the kind of plantation (bareroot or container stock), conventional or organic agriculture.

Plantation can be established by using a cultivator.

http://ocw.upm.es/ingenieria-agroforestal/industrial-utilization-of-medicinal-plants/

***Expanding Your Vocabulary*:**

brush - scrub vegetation
facilities - something (such as a building or large piece of equipment) that is built for a specific purpose
fine - very thin or narrow
nude – undressed, naked, bare
sprout – shoot, bud

DID YOU KNOW?

- Herb gardens are an easy and fun way to bring healthy, fresh foods and nutrients into your daily life. Organic herbs and plants should be an essential part of your diet.
- **CYCLE AND CULTIVATION TIMETABLE**

  Selection of plant - spring
  Management of nursery - autumn
  Soil preparation - autumn
  Selection of seed - autumn
  Sprout - winter
  Plantation - winter
  Fertilization - spring
  Maintenance task - spring

Harvest - summer
Distillation - summer
Package - summer
Storage – autumn

- The deadly dose of saffron is as little as 10 grams (3/4 tablespoon)
- Despite being synonymous with blandness, vanilla is one of the most complex spices in the world and the second most expensive, next to Saffron.
- Some people greatly dislike the herb coriander, saying that it smells like soap and tastes like crushed bugs. This reaction has been linked to a particular set of genes in some people.
- Mustard and wasabi aren't spicy until crushed. Only when the plant's cells are damaged can two otherwise harmless components mix and produce allyl isothiocyanate, the compound responsible for the familiar pungent taste.
- During the bubonic plague, doctors wore beaklike masks filled with aromatic items such as mint leaves, rose petals and cloves because it was believed that the putrid air spread the disease.
- The reason spicy food gets spicier after freezing and reheating is because capsaicin is stored in fats, which don't evaporate during reheating like the water in a food, so there is a higher percentage of the spice than in the food before, causing it to be spicier.
- India is a land where agriculture is the main industry. Varied people are using different agricultural practices. Few of the most important tips are documented below:
  - Ploughing the fields after every effective shower.
  - Wetland demands intensive care than garden land.
  - Red soil is suitable for continuous cropping.
  - Instead of ploughing broadly, plough deeply.
  - Deep ploughed garden lands conserve more moisture.
  - Plough four times for garden land and seven times for wetland.
  - Achieving fine tilth is better than applying cattle manure.
  - Plough deeply and sow thickly.
  - Sow in the right season even if it is a quality seed.
  - Apply goat manure for first crop and green manure for second crop.
  - Crop without weeding is not a full crop.
  - The poor prefer sesamum and rich prefer banana.

PART VI

OBTAINING RAW MATERIAL

It is only the farmer who faithfully plants seeds in the spring, who reaps a harvest in the autumn.

B. Forbes

Women with child that eat quinces will bear wise children.

Dodoens, 1578.

⁎MEDICINAL PLANTS & RAW MATERIALS INTRODUCTION⁎

Raw materials are matter which we extract from nature and which we use to produce consumer goods. They are classified according to their origin: vegetable, animal, or mineral.

A first look at the Medicinal Plants (MP) market allows us to distinguish between two major types of product: 1) plants or parts of plants, both fresh and dried, both whole or treated; 2) extracts, essential oils, and resinated oils (oleoresins), extracted as a primary treatment of the vegetable matter.

Both the above groups are the raw materials for industries such as perfumery, cosmetics, pharmacy and para-pharmacy, foodstuffs, and chemistry, which are the main users of primary transformation. To obtain these materials from farmed vegetable matter, the following processes are followed:

- ✓ harvesting (mechanised or by hand);
- ✓ primary transformations (drying, milling, refrigeration, liophilisation, freezing, distillation, extraction);
- ✓ secondary transformations (packaging, labelling, transport, conservation).

Each of these steps must be taken with strict quality controls to make sure that the raw material is suited to market demands and requirements, and therefore competitive.

http://www.galke.com/raw_plant_materials

***Expanding Your Vocabulary*:**

labelling – classification, cataloging

lyophilisation – (freeze-dry); a dehydration process typically used to preserve a perishable material or make the material more convenient for transport.

milling – crushing, grinding, refining

HARVESTING

Harvesting is the process by which we obtain the part of the plant which we will use (the drug). The drug is separated from the plant at the moment of harvesting (flower, roots), or part of the plant is gathered and the useful part (leaves) is then separated.

There are two forms of harvesting plants: 1) wild plants; 2) farmed plants.

Wild plants are usually harvested from March up/ until October/ November depending on the plant to be picked and the way it will be used. There is much legislation –though not enough- regulating the picking of certain species which require special permission.

Farmed plants are normally harvested after the first or second year of farming. They may be farmed for 3 to 5 years (thyme, satureia) or 5 to 8 years (lemon verbena, rosemary). Some plants are collected only once a year (rosemary), others several times a year, (melissa), and others every two or three years (valerian or esquinaceae).

There are some rules of harvesting medicinal plants:

- ❖ The farmer must know when to pick the plants and what part is required;
- ❖ Picking depends on the part of the plant to be used;
- ❖ Buds should be harvested at the moment of flowering;
- ❖ Flowers should be harvested just before flowering, preferably early in the morning;
- ❖ Roots should be harvested in autumn or in winter, or –if seeds are wanted - just after fruits appear.

Another important factor to bear in mind is to pick just at the moment when the active ingredient content is at its highest. For example, valerian is rich in valerenic acids and valepotriates, in February - March, and the maximum essential oil content is found in September.

Harvesting may be:

- ✓ manual (satureia or thyme bunches)
- ✓ semi-manual (lemon verbena leaves)
- ✓ mechanised (thyme, melissa, lavender)

Harvesting should be carried out in such a way that the both the quality and the health of the product are maintained, always avoiding contamination. Samples of vegetable matter are collected in the chosen season, before, during, or after flowering. A complete sample is taken: flowers, leaves,

stalks, and roots if an active ingredient contained in them should be investigated. They are then dried in the air until they reach a constant weight. The leaves, flowers and stalks are separated into sub-samples which are then weighed. If required, the plants are ground in a grinder, although this can be done by hand by simply chopping up the plants.

As a general rule, plants should not be gathered when the weather is wet/ damp (rain, fog). It is better to gather in the morning once dew has evaporated.

When harvesting in the field, plants should be harvested without breaking the roots, using appropriate tools. Site should be changed regularly so that the plants can regenerate, and all the samples of a species must not be taken from the same place, nor taken more than half of the leaves. Seeds and fruits should be left.

There are certain machines on the market designed and adapted for harvesting certain plants.

In some cases we can use modified cereal harvesters and forage cutters. For small surfaces (up to 2.5 hectares) a modified cultivator can be used for maintenance and harvesting.

***Expanding Your Vocabulary*:**

bear in mind - remember a fact or circumstance and take it into account:
chop – cut, slice
dew - moisture condensed upon the surfaces of cool bodies especially at night
grinder – crusher, a machine used for grinding something:
legislation – regulation, rule, law
manual – physical, by hand

HARVESTING TIME

Depending on the species chosen and the intensity of collection, reproductive cycles vary. Mint or equinaceae may be three years, for example, thyme, oregano and Melissa from 4 to 5 years, lavenders and rosemary from 8 to 9 years. The period for harvesting starts in May and can last up to October. Certain species are collected 3 or 4 times a season, whereas others can only be gathered once or twice.

The moment for harvesting depends on the part of the plant we are going to use (leaves, seeds, flowers, or roots), and we should remember that this is a key factor for obtaining the quality and richness in active ingredients we are looking for. Normally, production starts after one year, but if we plant

in autumn, many species are ready for a first harvest by the following summer.

Depending on conditions, plants can be gathered once, twice or three times a year. Thyme, for example, if irrigated, can be collected three times a year. Oregano once; melissa, like mint, can be harvested three or even four times; the surface parts of equinaceae three times; estragon twice; Salvia officinalis three times; Hypericum perforatum twice if irrigated; satureia two or three times; lavender once.

The rhythm of collection should always keep pace with the rhythm of production or transformation. Therefore, the harvesting capacity of the machinery used (hectares per day) should exactly match the capacity of the equipment used for transforming (tons per fresh plant per day), and the working capacity of the workers available and the collection periods of the species in question.

***Expanding Your Vocabulary*:**

match - to be suited to (someone or something)
pace – quickness, speed

POST-HARVESTING PROCESSES

The following post-harvesting processes are usual for medicinal plants (for pharmacological use).

Cutting: this is done to facilitate drying out as it increases the surface evaporation. It depends on the type of plant and on the technology employed.

Washing: drinking water is used to clean soil and other foreign matter from the part of the plant which is to be dried Disinfection: this consists in eliminating micro-organisms which are pathogenic for humans in different ways, until regulation levels are achieved.

Chemical: the matter to be dried is immersed in chlorinated saline solutions (sodium hypochlorite, calcium chlorite) so as to reduce the bacterial content to established authorised levels.

Physical: the matter to be dried is exposed to gamma radiation. This method is used when chemical disinfection is not efficient or when the vegetable matter comes from technified areas in which the yield flux is constant and little inorganic matter is present.

Bleaching: this process is used to prevent oxidisation. It consists of a "thermal shock", immersing the matter in hot water or steam to inhibit the effect of enzymes responsible for oxidisation.

Sulphitation: this process aims to preserve natural flavour and colour, help conserve the vegetable matter, delay loss of vitamins A and C, and counteract the growth of microorganisms.

It consists in placing the vegetable matter in a sulphur dioxide concentrate (prepared by combustion) of between 1.2% and 2% in a sealed camera for a period of time. The vegetable matter can be immersed in a sodium bisulphite or sodium meta-bisulphite solution as well, depending on the product concentrate levels and time periods being different.

http://ocw.upm.es/ingenieria-agroforestal/industrial-utilization-of-medicinal-and-aromatic-plants

***Expanding Your Vocabulary*:**

authorized - having official permission or approval:
bleaching - to remove color or dirt and stains from (something) especially through the effect of sunlight or by using chemicals; to make (something) whiter or lighter in color
combustion - a chemical reaction that occurs when oxygen combines with other substances to produce heat and usually light
flux - the action or process of flowing or flowing out:
immerse - to put (something) in a liquid so that all parts are completely covered
inhibit – to decrease the rate of action of or stop (a chemical reaction)
oxidization - the process by which a substance combines with oxygen or loses hydrogen
seal - a device or substance that is used to join two things together so as to prevent them coming apart or to prevent anything passing between them:

⁎ PRIMARY TRANSFORMATION ⁎

Transformation includes all the processes which allow us to preserve raw material, choose the parts to be used, eliminate foreign matter, grind or mill, extract active ingredients (extraction and distillation), so that the product may be packed and labelled ready for storage or transport. One must observe the established regulations for correct manipulation.

Gathered matter must undergo a transformation or manipulation process which will depend on what the end product is to be. The main processes for transformation and preserving are:

- drying and liophilisation if we require a dried plant
- extraction of non-volatile active ingredients
- distillation of essential oils (volatile)

- refrigeration or freezing for fresh and frozen plants respectively

∗ DRYING ∗

Drying is the easiest method of preserving herbs. Simply expose the leaves, flowers or seeds to warm, dry air. Leave the herbs in a well ventilated area until the moisture evaporates. Sun drying is not recommended because the herbs can lose flavor and color.

The best time to harvest most herbs for drying is just before the flowers first open when they are in the bursting bud stage. Gather the herbs in the early morning after the dew has evaporated to minimize wilting. Avoid bruising the leaves. They should not lie in the sun or unattended after harvesting. Rinse herbs in cool water and gently shake to remove excess moisture. Discard all bruised, soiled or imperfect leaves and stems.

The aim of drying is to dehydrate to below 10% and to prevent enzymes from acting; to avoid attacks from bacteria and fungi, which cause mould and thus a loss of quality. Drying also means the vegetable matter is easier to transport. There is a problem because not all drugs have the same degree of humidity. The texture of drugs is also different and this affects the degree of evaporation. Active ingredients present different reactions to temperature. Drying should be as fast as possible and should not alter the active ingredient. After drying humidity must be measured, it must not be below 10%. The method used will depend on the nature of the drug, its humidity, consistency, and the type and quality of the active ingredient. Alkaloids are more resistant than glycosides and sugars. Due to their volatility, essential oils cannot be dried at high temperature. There are three methods: air, heat, and vacuum.

Drying in air.

This process is used in countries with a warm, dry climate, for small quantities of drugs whose active ingredients are stable. Drying is carried out in the shade as the sun would cause photosynthesis in the drug. The drug is protected from night-time humidity. Drying takes place in closed but ventilated rooms, the drug being spread out in thin layers. The process is slow, and desiccation into the air may occur.

Drying by heat.

This is the commonest method used and has the advantage that we can control the two factors which affect good desiccation: temperature and ventilation. We need to ensure a rapid elimination of humidity without changing the active ingredient. If the temperature is high, a rapid surface evaporation takes place and a dry layer appears which prevents further drying. Drying by this method is usually at 30-40 degrees, or 60-70 degrees for bark, always depending on the active ingredient. Ventilation ensures that

air is in contact with the drug up to water saturation point. Once the air is saturated it is changed. Small scale drying takes place in ovens with air vents, and industrial drying takes place in drying tunnels. The latter have a heater at one end and a fan at the other. The drug is placed in the tunnel on trolleys with several shelves, so as to achieve progressive drying. As the trolley moves along the tunnel the heat it is subjected to diminishes.

This drying operation is used industrially: the drying areas are designed and built for a specific quantity and type of vegetable matter which is to be treated.

The conditions (temperature and humidity) for this process depend, particularly, on the species to be treated. The water content of the vegetable matter to be dried is of primary importance, as it is its capacity for water retention, the maximum drying temperature, and the humidity in the air to be used. When calculating the capacity of the drying equipment the amount and volume of the fresh vegetable matter to be dried in a certain time should be taken into account.

When producing dried plants one can use both natural drying (which takes longer and requires more space) by hanging or on trays, or forced drying, which involves blowing hot, dry air around a sealed area to extract moisture and cold. It is much faster, though this depends on the moisture of the plant. Appropriate drying temperatures are between 32 and 35 degrees, so as not to destabilise the active ingredients nor the volatile essences. It is best to reduce drying time to avoid this.

***Expanding Your Vocabulary*:**

alter – change, modify
appropriate – suitable, proper
bruise - to cause a mark to appear on someone's body by hitting or knocking it; to damage a piece of fruit and cause a soft brown area to appear on its surface
bud - a tightly curled up part of a plant that will open to form a leaf or flower
burst - to break open or into pieces in a sudden and violent way
desiccation – dryness, dehydration
diminish – reduce, lessen, weaken
layer – coating, sheet; a branch or shoot of a plant that roots while still attached to the parent plant
oven - a piece of cooking equipment used for baking, heating, or drying
retention – preservation, maintenance
stable – steady, unchanging, unchanging

trolley - a large metal basket or frame on wheels, used for transporting heavy or large items

wilt – (*of a plant)* to bend over because of not having enough water; to become weak and tired especially because of hot weather

⁎ POST-DRYING

Once the plant has been dried, the part to be used must be separated and the others and any foreign matter (soil, stones) must be eliminated.

The separation process can be done using machines with sieves, or air tubes which separate different densities using air currents. Metals can be separated by adding magnets as well. Later, depending on the purpose or presentation, it is possible to: *mill* (powders for capsules or tablets, condiments); *grind* (tins, tea-bags).

Once the vegetable matter is dry (10-11% moisture content) it can be stored without risk of biological processes degrading its active ingredients.

⁎ LYOPHILISATION ⁎

This process involves dehydration by freezing. The vegetable matter is subjected to very low temperatures (-30, -80) so that the water freezes into fine crystals. The ice is then sublimated in a vacuum.

⁎ REFRIGERATION ⁎

Refrigeration maintains organoleptic qualities and appearance. For the process to be efficient, the temperature must be reduced quickly to avoid loss of moisture. The optimum temperature is 2 to 9 degrees.

⁎ FREEZING ⁎

When freezing, one should bear in mind that plants lose texture when frozen. However, it is excellent for pre-cooked meals where aroma and taste are important. Frozen products last up to 6 months in a fridge, and between 10 and 12 months in a more powerful freezer and in freezer bags. The best plants for freezing are: basil, garlic, celery, estragon, thyme, mint, parsley, marjoram, lemon verbena, oregano, rosemary, satureia, salvia and melissa.

⁎ DISTILLATION ⁎

This process of transformation allows obtaining essential oils. These are oily substances made up of a large number of complex chemical compounds which are aromatic but highly volatile. Producing essential oils depends on the species, the variety, the environment and conditions of

growing, the years of cultivation, and on the distilling process itself. Distillation is a very simple physical process, and the usual method is to use dragging by steam. This process does not require sophisticated equipment, and guarantees a good yield of good quality essence. A distillation set consists of: a) a heater; b) a distillation flask; c) a cooling tube; d) a Florentine flask.

The fresh vegetable matter (which may be dried slightly) is placed in the distillation flask making sure that it is evenly distributed. Once full, the flask is hermetically sealed and steam is passed through the bottom at a certain pressure. The steam opens the glands where the oil is stored and drags it out, forming an emulsion of steam and oil droplets. This passes through the cooling tube where it condenses into water and oil. This mixture is then put into the Florentine flask where the two liquids separate due to their different density.

When choosing a distillation set one must bear in mind:

- the amount of plant to be distilled;
- the harvesting period of the species to be distilled.

Essential oils obtained using this process can be stored for long periods of time in appropriate conditions (darkness, at a temperature between 12 and 15 degrees, in galvanised jars).

∗ EXTRACTION ∗

This process involves subjecting fresh or dried plant matter to the effects of one or more solvents so as to obtain a liquid or solid which contains the active ingredients. It can be carried out in normal atmospheric conditions, in a partial depression, or in the presence of a gas. Industrial processors use simultaneous extraction, extraction in line, or extraction in constant flux, employing one or more solvents. They have a built-in solvent recycler.

Extraction is a chemical process that uses different solvents (with more or less polarity) to obtain a liquid that contains the active ingredient needed. Water has limited extraction power compared with other solvents used. The most commonly used of the latter is alcohol of different degrees. Many extracts are carried out using this solvent. Other solvents include ether, chloroform, acetone, propilengricol.

***Expanding Your Vocabulary*:**

condiment - a substance such as salt, mustard, or pickle that is used to add flavour to food.

currents – flows, streams

eliminate – remove, exclude

flask - a narrow-necked glass container, typically conical or spherical, used in a laboratory to hold reagents or samples.

jar - a wide-mouthed cylindrical container made of glass or pottery

recycler - equipment designs and delivers high-quality machines and solutions for recycling and waste processing tailored to each specific business

simultaneous - occurring, operating, or done at the same time:

sublimate - transform (something) into a purer or idealized form:

tin - an airtight container made of tinplate or aluminium; a silvery-white metal, the chemical element of atomic number 50. (Symbol: Sn)

⁎ SECONDARY TRANSFORMATION PACKING AND LABELLING ⁎

Secondary transformation consists in packing and labelling the raw material.

⁎ PACKING ⁎

Packaging isolates the raw material from external influences. It is possible to use: a) paper; b) Kraft paper sacks; c) polypropylene, polyamide; d) wooden or cardboard boxes.

Oils are put in topaz glass or in aluminium-lined containers. Polyethylene, polypropylene and polyvinyl chlorate are not suitable as they absorb the essential oils.

⁎ LABELLING ⁎

Labels identify the raw material. They must contain at least the following information:

- name in Latin
- common name (this varies locally)
- plant part used
- presentation
- batch number
- place and date of collection
- use-by date
- supplier´s name
- net weight

The invoice is the documentation that comes with the product. It identifies and defines the product and allows confirming delivery to the client. It should contain the following information:

- ✓ supplier´s name
- ✓ supplier´s address
- ✓ product name
- ✓ batch number
- ✓ total weight of batch
- ✓ number of packets, bottles…
- ✓ order number
- ✓ invoice number
- ✓ date

To sum up, the conditions in which secondary transformation takes place also affect the quality of the product. The following facts should be kept in mind:

- ❖ if adequately dried, products can be transported and preserved without loss of quality, maintaining organoleptic characteristics, active ingredient content, moisture, and microbiology;
- ❖ the type of container affects quality, preservation, and cross-contamination;
- ❖ correct labelling allows to identify the product and avoid mistakes;
- ❖ appropriate manipulation during secondary transformation ensures that the quality at the time of growing and harvesting is maintained.

*** PRESERVATION ***

Quality preservation depends basically on two things: *storage* and *transport*.

Storage

The harvested product must be stored in such conditions that quality, health and innocuousness are maintained until the product reaches the consumer. Adequate storage prolongs the product usefulness. Two basic factors which affect end quality should be concentrated on:

-the type and conditions of the storage area

-factors which affect the product during the process and period of storage

Storage of plants is usually in paper or hessian plastic sacks, or in boxes. One should prevent fresh plants from fermenting. Each sack/ package should be labelled with the name of the producer, the species, presentation, and date of harvesting. In many cases the drug is sterilised (ethylene oxide) to prevent micro-organisms. Changes may happen during storage: oxidisation due to the air, reactions due to heat, changes in the appearance of the drug due to light, or the appearance of mould due to humidity.

If the drug is very hygroscopic, a drying agent is usually added in a net. Drugs should be stored in dry, ventilated, shady places, at a low temperature, away from insects. Metal boxes are better than plastic ones. It is better to store the drug whole and pulverise it at the moment of use.

Drugs may not be kept indefinitely, and usually last one or two years. Barks last three or four years.

***Expanding Your Vocabulary*:**

batch – set, lot, group
hessian – canvas, sacking
innocuous - causing no injury; not harmful or offensive:
label - a small piece of paper, fabric, plastic, or similar material attached to an object and giving information about it:
prolong – extend, lengthen
sack – bag, delivery bag
shady - out of the sun
topaz - a dark yellow colour

FACTORS WHICH AFFECT STORAGE

Light. Most plants lose colour when exposed to light, especially leaves and flowers. Moreover, active ingredients degrade more rapidly.

Temperature. The cooler the store, the better the preservation of raw materials is. Heat favours loss of essential oils. It also attracts insects and causes microbiological contamination.

Humidity. This has two negative effects: it activates certain enzymes, especially glycocidates, and increases contamination by fungi, mould and yeasts.

Size of ground matter. The smaller the ground product, the greater the surface exposed to external factors. This is particularly important for plants which contain essential oils (mint, camomile), tannins (mahogany, witch hazel), or bitter ingredients (centaureae, gentiana).

A dry room is the best place to keep raw vegetable material, at a temperature below 10 degrees, and with less than 60% humidity.

TRANSPORT

Products may spoil when manipulated or transported. One must ensure that harvested products keep their innocuousness and wholesomeness. Transport should be as quick as possible and conditions should be the same as those for storage to avoid deterioration.

Products should be protected from the effects of the weather when they are transported to prevent contamination or deterioration. Vehicles used for transporting products should be thoroughly clean and dry at the time of loading and, preferably, disinfected. It is best to load and unload during the daytime, because at night artificial lighting attracts insects which may get into the containers. Loading and unloading should be carried out in places sheltered from the weather and pollution, and away from the processing area. The load should be secured firmly while transporting, to stop it moving as this may deteriorate the quality. Vehicles used for transport should be parked and kept away from the product processing area to avoid pollution from exhaust fumes.

When large loads are carried it is best to ensure there is dry air ventilation to eliminate moisture formed by the plants´ respiration and to avoid condensation forming each time the vehicle passes from a warm area to a colder one, or a dry area to a wetter one, or if travelling during the night. It is best to pre-establish loading and unloading areas. Containers should be handled with care to make sure they do not break and that the product is not damaged.

When transporting mixed loads, one should consider their compatibility (smell, pollution, colour) and make sure that there are no toxic substances. Different temperature and humidity requirements must be considered as well.

The vehicle should be checked carefully, making sure there are no cracks or other gaps which might let water in, and that the locks work properly. The vehicle should not be parked in direct sunlight during stops. It is also better not to stop next to other vehicles or machinery which emit fumes.

***Expanding Your Vocabulary*:**

compatibility - able to exist together without trouble or conflict
deterioration – worsening, decline, corrosion
emit - produce and discharge (something, especially gas or radiation):
fume - an amount of gas or vapour that smells strongly or is dangerous to breathe in
shelter - to be in a place that provides protection from danger, bad weather, etc.
spoil - reduce or destroy the value or quality of *smth*

FROZEN PLANTS

Cryo-conservation is widely used in the pharmaceutical industry. This process consists in preparing, conserving, and keeping a product for a long

period of time at an ultra-low temperature (-196 degrees), using liquid nitrogen (LN). This process allows us to manipulate the product without losing volatile active ingredients.

An associated process is cryo-grinding: this is the pulverisation of the active part of a dried plant which has been cryo-conserved. This process gives us a homogeneous powder (cryo-ground powder) which allows the phytotherapist to obtain an optimum and constant activity. Cold is used for this process because recent studies have shown that traditional grinding causes temperature to increase which deteriorates the volatile substances, vitamins, enzymes, and many active ingredients.

LYOPHILIZED PLANTS

These plants are fresh plants which have been dehydrated by freezing. In contrast with drying, these plants have not been subjected to heat, and so certain molecules (such as vitamins) maintain their properties and are no destabilised. Royal jelly, for example, is commercialised using this process. Also Aloe Vera gel.

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- http://www.cals.ncsu.edu/specialty_crops/medherbs/1.htm
- http://www.nlm.nih.gov/about/herbgarden/list.html
- http://www.medicinehunter.com/about-plant-medicines

***Expanding Your Vocabulary*:**

cryo-conservation - a process where cells, whole tissues, or any other substances susceptible to damage caused by chemical reactivity or time are preserved by cooling to sub-zero temperatures.

destabilize - to make unstable

deteriorate – worsen, depreciate, deteriorate

grind – (ground, ground) - to crush or break (something) into very small pieces by rubbing it against a rough surface or using a special machine

DID YOU KNOW?

- *Leaves* are gathered when they are young but completely developed, just before the flowers develop completely (when flowering starts).

- *Flowers* are gathered when they have opened fully but are still fresh.
- *Fruits* are collected when ripe.
- *Roots* should be strong and completely developed.
- *Bark* is taken from young shoots.
- *Grasses* are collected when flowering starts.

- **Commercial products that can be obtained and the transformations they require.**

Initial Product	***End Product***	***Transformation***
Fresh plants	Fresh plants Dried plants Frozen plants Liofilised plants	Washing, disinfection, packing Chopping, drying, sieving Washing, disinfection, freezing Freezing, sublimation
	Essential oils Extract Oleoresin	Grinding, airing, distillation Grinding, airing, extraction Dehydration, extraction, evaporation

Table by: M. T. López – Ajero, 2007.

- Did you know that ***Cranberry***:

  * served at the thanksgiving table:
  * can heal urinary tract infections?
  * contains powerful antioxidants?
  * has the ability to reverse and inhibit the gathering of oral bacteria responsibly for dental plaque and periodontal disease?
  * may help prevent peptic ulcers?
  * offers a natural defense against atherosclerosis?
  * may provide protection against chronic age-related afflictions like loss of coordination and memory?

- Fresh cranberries are harvested from September to November and that is the time to stock up. When you get them home, store them refrigerated for up to two months or toss them into the freezer for up to a year.

PART VII

INDUSTRIAL USE

"And God said, Behold, I have given you every herb bearing seed, which is upon the face of all the earth, and every tree, in the which is the fruit of a tree yielding seed; to you it shall be for meat."

Anonymous, Holy Bible: King James Version

∗ CLASSIFICATION OF NATURAL PRODUCTS ∗

Natural products are compounds consisting essentially of carbon derived from natural sources (flora, fauna, land, etc.). And that generally have very diverse and interesting properties. Some of the most relevant applications of the Natural Organic Products are using it as: *fuels, plastics, fats, soaps, sugars.*

Petroleum *(*Petra = stone; Oil = oil) is a naturally formed by liquid mixture of hydrocarbons, which are processed in the petrochemical industry through fractional distillation and cracking to gasoline, natural gas, etc.

Soap is the sodium salt of a fatty acid. Have a party hydrophyllic (dissolves in water) and other lipophyllic (fat dissolves dirt).

Sugars are natural polyhydroxialdehides or polyhydroxiketones with different functions: structure, energy storage components of the nucleic acids, etc. They are formed by photosynthesis in plants and are classified into monosaccharides (glucose), disaccharides (sucrose) and polysaccharides (cellulose, starch, etc.). Sweeteners are natural or synthetic substance that gives a sweet taste to food. We can find natural sweeteners such as sucrose (cane and beet), fructose (sugar simpler and sweet, honey), lactose and galactose (sugars from milk, less sweet), and synthetic as: saccharin (300 times sweeter than sucrose), aspartame (160 times sweeter), etc.

Agro-chemicals: pesticides, plant growth regulators, etc.

Modifiers of animal behaviour (***pheromones***).

Flavours and perfumes. Food Additives (flavours, colours, antioxidants, etc.)

Drugs: Product to be administered for curative purposes. Although there are many natural source products that are used as drugs, the synthesis of drugs is well developed and provides a large amount of chemicals that are used as such. For example: sedatives, antiinflammatories, diurethics, antiviral, hepatoprotectors, etc.

Regulators: like dopamine, used for Parkinson´s síndrome (only L-Dopa is active)

Antibiotics: chemical products able to inhibit the growth of microorganisms and even destroy them.

Analgesics: drug that relieves pain without causing loss of consciousness. Painkillers are a large group that ranges from the derivatives of opium (solid product obtained drying the milky juice of the opium poppy "Papaver sommiferum" with a 25% alkaloids), and morphine (potent analgesic, very toxic and produces dependence), codeine (anticoughing, produces no habit), heroin (synthetic derivative obtained by acetylation of morphine, good analgesic with less depression than morphine addiction but more addiction), methadone (synthetic substitute for heroin with analgesic properties but also cause addiction) to opiates, such as aspirin, which is derived from the Silicilina (glycoside from the bark of willow formerly used as an analgesic), Paracetamol and ibuprofen. The application of topical analgesics includes all anti-inflammatories, such as hydrocortisone and derivatives, and the general and local anesthetics at low doses.

A. Natural Products classification based on their chemical structure

It is based on the type of chemical skeleton. So there are

- Aliphatic or non-aliphatic fatty compounds of open chain as: fatty acids, sugars and a great amount of amino acids.
- Acyclic and cycloaliphatic compounds as terpenoids, steroids and some alkaloids.
- Aromatic or benzoic compounds as phenols, quinones, etc.
- Heterocyclic compounds such as alkaloids, flavonoids and nucleic acid bases.

Many natural products belong to more than one of these categories. For example, geraniol, farnesol and scualene belong to class 1, and thymol to class 3, but because of the biogenetic considerations they are treated as class.

B. Natural Products classification based on their physiologic activity

Approximately one half of the medicines used today are natural products, i.e. alkaloids, antibiotics or synthethic analogs. For that it is usually employed a classification that represents the physiologic activity, such as hormones, vitamins, antibiotics ad mycotoxins. Even though the compounds belonging to each group have different structures and biogenetic origins, a narrow relationship is occasionally between those aspects and activity.

C. Natural Products classification based on their taxonomy

This classification is based on morphological studies of plants, or plant taxonomy. In animals and some of the microorganisms, final metabolites are

generally excreted outside the body, while in plant metabolites are stored inside the plant. While it was thought that some metabolites were specific of some plants, we know today that are widely distributed in the plant kingdom and many constituents of plants such as alkaloids and isoprenoides have been isolated from species, genera, families or specific plant. For example, the "opium" of Papaver somniferum contains twenty alkaloids such as morphine, thebaine, codeine, and narcotine. They are all biosynthesized from precursor 1-bencilisoquinolina by oxidative coupling.

So, alkaloids that have similar characteristic structures are constituents of this kind of plants and are designated as alkaloids opiates. Similarly, frequently appears in the literature names representing genera and families such as ergot alkaloids, iboga alkaloids, and menispermaceae alkaloids. Our knowledge of the constituent plant has been expanded to a dramatic rate in recent years due to progress in the methods of isolation and microcharacterization. This has led to a new field called "chemotaxonomy" or "chemosystematics", which tries to study the constituents of plants according to their taxonomy. Ultimately, the phytochemical constituents are considered as markers to understand the evolution and classification of plants.

However, the number of compounds known for each plant are still quite limited and, moreover, all plants have not been studied yet. Undoubtedly, a meticulous and laborious study from a large amount of plant material will lead to a clearer idea of its constitution and allow the isolation of products even if they have no well-known biological activity whatsoever. Still organized knowledge of the constituent plant according to the taxonomy is an area of great interest and importance at the present time.

D. Natural Products classification based on their biogenesis

Although "biogenesis" and "biosynthesis" are terms that are used sometimes indiscriminately, it is customary to use the first term for a hypothesis, and the last for a synthetic route tested experimentally.

The constituents of all plants and animals are biosynthesized in organisms through enzymatic reactions. The most commonly source of carbon used is the glucose, which is photosynthesized in green plants (autotrophic organisms) or obtained from the environment heterotrophic organisms. The relatively recent advances in biochemistry have greatly clarified the interplay between enzymatically catalyzed reactions of the "primary metabolites (such as sugars, amino acids and fatty acids) and biopolymers (such as lipids, proteins and nucleic acids). These metabolites lead to "secondary metabolites," so called because it is obvious his role in the metabolism of many organisms.

When in the years 30 our understanding of the chemistry of natural products had some size, some organic chemicals began to develop routes biogenetic theories of natural products in living organisms on the basis of its structural regularity.

There are at present three known major routes that enable key biosynthesis of the vast majority of different types of natural products known:

Mevalonic acid route: from it, prenyl units are formed, an after successive links they led to isoprenoids (terpenoids, steroides, carotenoids)

Shikimic acid route: From it, amino acids are formed and from them, and other aromatic compounds more complex (phenylpropanoids, flavonoids, alkaloids)

Acetate – Malonate Route (polyketide route): From malonate and acetate are formed polyketides (Ketogenines) and fatty acids are formed.

http://dnp.chemnetbase.com/intro/DNPIntroduction.pdf

Expanding Your Vocabulary:

approximately – about, nearly
couplin. – connection, join, link
excrete - to get rid of liquid, solid, or gas waste from your body
laborious – difficult, lengthy, arduous
meticulous – careful, thorough

* HERBAL PREPARATIONS *

The following are common preparations used in herbal medicine. Be sure to put all herbal preparations into sterilized containers for storage and take note that most should be made fresh each time. Only tinctures don't spoil quickly.

Note - The proportions here are for dried herbs. If you are using fresh herbs, double them.

* INFUSION *

Infusions are used when we want to extract the volatile oils of a plant.

An infusion is made like tea. Most recipes require that the boiling water be poured over the herbs, though some want the herbs added to the water. Usually, it's about 1 teaspoon dried herb to 1 teacupful of boiling water, though the recipe is subject to variation depending on the herbs you are using. You can, of course, adjust to taste for most herbs, but for potentially dangerous herbs, you should always stick to the recipe.

Herbs should be steeped for about ten minutes. Place some sort of cover over your teacup or teapot while the herbs are steeping to prevent the escape of the valuable oils. Once the herbs have steeped, they should be strained out.

You may sweeten the infusion with sugar or honey if you wish. It should be drunk lukewarm or cool, except in the case of preparations designed to induce sweating or break up a cold.

* DECOCTION *

Decoctions are used when we want to extract the mineral salts and bitter properties of a plant. The decoction method is mainly used for hard, woody substances (such as roots, bark, and stems) that have constituents that are water-soluble and non-volatile. (Red clover is an exception, because red clover flower decoction will extract more minerals that the infusion.).

Using 2 teaspoons herb per cup of water, place the herbs in a pan and cover with the water. Bring to a boil. Stir and cover tightly. Allow to boil about 3 more minutes, then remove it from the heat and let it steep for another five minutes or so, still tightly covered.

Using the same proportion of woody or hard root material per cup of water, follow the same steps as above, but allow the mixture to boil, covered, for 10 minutes before removing it from the heat.

Plant parts should be strained out before drinking. The decoction can be sweetened with sugar or honey and should be taken hot if it is being used to break up a cold or to induce sweating. Otherwise it can be taken cold or lukewarm.

Decoctions are intended for immediate use. Store for a maximum of 72 hours in the refrigerator.

* COLD EXTRACT *

A cold extract is called for when you want to minimize the loss of volatile oils and do not seek to extract mineral salts.

Using two teaspoons of dried herbs to one cup water, place in a non-metal container. Let it stand overnight. Take as you would an infusion. Refrigerate unused portion and take within 24 hours.

* JUICE *

Juicing retains vitamins, minerals and volatile oils the best.

Chop up the fresh herb and press to release the juices, add some water and press again. Unfortunately, juicing by hand leads to a great deal of waste.

If you have a commercial juicer, you should use that. Drink immediately for best value.

* POWDER *

Powdered herbs can be sprinkled onto food or into drinks or added to a gelatin capsule and taken like a pill.

Grind dried herbs with a mortar and pestle until you have a powder. Depending on the herb, two to three pinches of powder is usually a sufficient dose.

* SYRUP *

Syrup is a more pleasant way of taking medicine all around.

To make the basic syrup, dissolve three pounds of sugar into a pint of water and boil, stirring constantly, until it reaches the desired consistency. Then add the desired infusion or decoction. Alternatively, the herbs can be boiled in honey and then strained out.

* TINCTURE *

Tinctures last the longest. Use a very fine grain, high proof alcohol, vodka is suggested.

Depending on the potency of herbs, use about 1 ounce dried herbs to 8 ounce alcohol. Combine these ingredients in a wide-mouthed non-metal container and let stand for two weeks, shaking once or twice a day. Then transfer into a sterilized container suitable for long-term storage, as tinctures are generally dosed out in drops, a dropper would be helpful.

* ESSENCE *

Essence is a substance obtained from a plant, drug, or the like, by distillation, infusion, etc., and containing its characteristic properties in concentrated form. It is created by dissolving one ounce of essential oil into a pint of alcohol.

* POULTICE *

Poultices are used to apply herbs directly to affected areas of the skin with moist heat. Pound fresh herbs into a pulpy mass and apply to the affected area. Soak a cloth in hot water and place over the herbs. Replace the hot cloth as it cools. If using dried herbs, add warm water and soak a bit. If necessary, mix with corni meal or flour. In some cases, herbs may be used

that might be irritating to the skin. If this be the case, the poultice should be placed between two pieces of cloth and applied that way.

After the poultice is removed, clean the area carefully with water, or an infusion of chamomile.

∗ FOMENTATION ∗

A fomentation is a special preparation that allows herbs to be absorbed through the skin. It is prepared by first making a strong infusion, or tea, from the herb parts (usually the leaves, roots, or flowers). A clean cloth is then dipped into the warm tea and applied to the skin. When it cools, the cloth must be wrung out and dipped again to keep it warm. The fomentation should be applied for several hours at a time and perhaps for several days, depending on the condition being treated. Redness of the skin is normal and indicates increased circulation, so do not discontinue unless skin feels painful.

Properly used herbal remedies treat the underlying cause of problems

∗ COLD COMPRESS ∗

An herbal compress is a simple and natural application used to treat a variety of common ailments. A compress is a remedy of a cloth soaked in herbal tea and applied to the affected area. Similarly, an eye wash is an herbal tea solution that is applied directly to the affected eye area.

An appropriate healing herb compress is one made with chamomile. Chamomile is a good choice when making an easy herbal compress or herbal eye wash. The benefits of a chamomile herbal compress are endless, as the herb acts as an anti-inflammatory, disinfecting, anti-allergenic, and immunity-stimulating product.

∗ HERBAL BATH ∗

Herbs can be chosen for their therapeutic offerings; such as softening, soothing muscles, stimulating circulation or drawing out infection. There are some basic rules to follow in order to get the most out of the experience.

Method 1: Place the herbs you wish to use inside a cloth and throw it into the bathtub. The herbs will infuse into the water as the bath is filled.

Method 2: Add a few drops of essential oil to your bath after it has been filled.

Method 3: Add a bit of an infusion or decoction to your bath.

Bathing in herbal scented water can help reduce stress, soothe the skin and just be a relaxing experience for everyone. When creating an herbal bath, enclose the loose herbs in a sachet, or bag to keep them from sticking to the

skin. Also, avoid using extremely hot water, as it is very drying to the skin. Plan on a 10 minute soak, to enjoy the full benefits of using herbs in this way.

http://www.healthynewage.com/blog/

Expanding Your Vocabulary:

ache - pain
chilled – cool
decoction – a concentrated liquor resulting from heating or boiling a substance, especially a medicinal preparation made from a plant:
decoction - a liquid preparation made by boiling a medicinal plant with water usually in the proportion of 5 parts of the drug to 100 parts of water
fomentation - the application of hot moist substances to the body to ease pain
fume - a smoke, vapor, or gas
inhale - to breathe in
irritate - make (someone) annoyed or a little angry
lukewarm - moderately warm
mortar - a deep bowl used for pounding or crushing substances (such as medicines)
ounce - a unit of troy weight equal to 1⁄12 troy pound or 31.103 grams; a unit of avoirdupois weight equal to 1⁄16 avoirdupois pound or 28.350 grams
pestle - a hard tool with a rounded end that is used for pounding or crushing substances (such as medicines) in a deep bowl (called a mortar)
pinch - a firm hold between fingers and a thumb
poultice – compress, bandage, icepack
poultices - a soft, usually heated substance that is spread on cloth and then placed on the skin to heal a sore or reduce pain
pound - to crush or break (something) into very small pieces by hitting it again and again
pulpy – soft, spongy
sachet - a small, thin package; a small cloth bag containing a powder or a mixture of dried flowers and spice with a pleasant smell to be put in a drawer to make clothes smell nice
soak - make or allow (smth) to become thoroughly wet by immersing it in liquid
strain – tension, stress, anxiety

sweat - to produce a clear liquid from your skin when you are hot or nervous

∗ HERBAL TEAS – WISDOM IN A CUP ∗

The simplest and most traditional way to bring the medicinal aspect of plants into ones daily diet is to prepare herbal teas. Herbal teas are made as simple infusions of single or blended plant materials. They not only taste exciting and wonderful but also often enhance the function of the digestive system, relax or stimulate the mind or have a calming or invigorating effect on ones' spirit. A tea, also known as an infusion, is made by adding boiling water to fresh or dried plants and steeping them 5-10 min. The tea may be drunk either hot or cold. Roots, bark, and berries require longer exposure to heat to extract their beneficial ingredients. They are simmered in boiling water for longer periods than teas, making a decoction, which also may be drunk hot or cold.

Herbal teas like chamomile, peppermint and fennel are widely available throughout the stores and consumed by many. These are the most remembered herbs from the times when tea from the Camelia sinensis bush, which has come to dominate our culture, was still in India and China and coffee and chocolate was still in South America. Thanks to the real ale industry, hops have stood the test of time too!

But there are many more dried or fresh herbs for us to use and enjoy in our day to day lives.

http://www.nyrnaturalnews.com/article/plants-in-our-lives/

<u>Expanding Your Vocabulary:</u>

ale - an alcoholic beverage brewed especially by rapid fermentation from an infusion of malt with the addition of hops

bark - the tough exterior covering of a woody root or stem; the tissues outside the cambium that include an inner layer especially of secondary phloem and an outer layer of periderm

digestive system - the bodily system concerned with the ingestion, digestion, and absorption of food

enhance – improve, increase, enrich

hops - *plural*: the ripe dried pistillate flowers of a perennial north-temperate zone twining vine (*Humulus lupulus* – хмель обыкновенный) of the hemp family used especially to impart a bitter flavor to malt liquors

invigorating – stimulating, refreshing, energizing

simmer - to cook slowly in a liquid just below the boiling point

spirit – emotion, soul,
steep **-** to put (something) in a liquid for a period of time

⁎ EXTRACTS ⁎

In botanical medicine, an extract is the maximum concentration of a plant that is made by extraction with a solvent. Extracts may be in the form of tinctures, liquid extracts, solid extracts, and powdered extracts. Quality is usually expressed as an intensity quotient of 1:1 or 1:2, or established according to standards if it is a compound or group of chemical compounds.

Powdered extract

Powdered version of liquid or solid extracts in the USA Pharmacopoeia, it is prepared by evaporating liquid content. The concentrate quotient is between 1:1 and 10:1 or even more.

Solid extract

Liquid extract (in the USA Pharmacopoeia), concentrated by evaporation or vacuum extraction. It has a dried grass quotient of 4:1.

Standardised extract

Powdered extract prepared by evaporation. Nevertheless, it contains a "standard" amount of a plants main component. The active ingredient is identified and guaranteed.

This extract contains specific amount of a certain chemical compound or of a group of chemical compounds which are supposedly active. Extracts which contain a high concentrations of active chemical products from a pharmacological point of view, are produced depending on the physical and chemical properties of the compounds using appropriate solvents (water, ethanol, methanol, hydro-alcoholic mixes) at predetermined temperatures.

Complete extract

It contains the complete spectrum of ingredients originally present in the plant, as well as the active compounds which are formed during the process.

Liquid extract (USA Pharmacopoeia)

Alcoholic or hydro-alcoholic preparation with a dried or fresh plant content of 1:2.

Spice oleoresins are obtained from spices dried by extraction using a volatile, nonaqueous solvent, followed by solvent elimination by evaporation at moderate temperatures and in a partial vacuum. In Spain, Paprika oleoresin is produced for use in the foodstuffs industry.

http://ocw.upm.es/ingenieria-agroforestal/industrial-utilization-of-medicinal-and-aromatic-plants/

DID YOU KNOW?

- Today's modern healthy lifestyles are learning to include ancient herbs and supplements as part of a holistic approach to life. Ginko, Ginseng etc. have never been so widely used.
- Compresses and eye washes, poultices, and fomentations are popular topical (external) applications to affected areas.
- Besides medicinal use, herbs have always been part of human food preparation. Who can imagine a life without Basil, Thyme, Rosemary or any of the herbs we've come to love in our cuisine?
- One is advised to start with the lowest recommended dosage to try and test whether the herbal treatment is suitable to your body and does not have any adverse reactions. Herbal medicines coming in the form of teas and tinctures should always be taken on an empty stomach for better absorption, and capsules as well as tablets should be taken along with the meals. If you find any inconvenience on taking herbal medicine for the first time and not confident, it is advisable to seek the advice of the doctor immediately.
- Aromatherapy owes its existence to fresh, organic herbs.
- Commercial uses are:

Fresh leaves for cooking: basil, coriander, estragon, thyme, laurel, melissa, mint, rosemary, salvia, etc…

Edible flowers*:* pansies, thistle, calendula, courgette…

- Dry drugs may be in the form of:

- Roots: valerian, genkian, bardana, dandelion, arnica, liquorice
- Plant: nettles, dandelion, aniseed, horsehair
- Leaves: mint, lemon verbena, estragon
- Petals: damask rose, malva
- Seeds: coriander, aniseed, cumin
- Bark: Cinnamon
- Stamen: saffron
- Tambrils: maize
- Flowers: camomile, arnica, elder

- Buds: cloves
- Fruits: lemons, nutmeg, juniper

➢ Seasoning preparation is simply sprinkling powdered herbs on your vegetables as well as salads.

➢ The word for medicinal bathing — thalassotherapy or hydrotherapy — comes from the Greek philosopher Thales, who believed that everything is derived from water. The Greek word thalassa means "small sea."

➢ Best Bathtime Herbs

- *Lavender Blossoms* are cleansing and relaxing inducing a sense of calm.
- *Roses Petals & Buds* calm and soothe the heart while relieving inflammation and toning the skin.
- *Chamomile Flowers* gently eases the nerves and soothes the skin, great for kids.
- *Calendula Flowers* is very skin-soothing and even promotes cell repair making it a great healing herb in the bath.
- *Peppermint & Spearmint Leaf* give a delightful happy scent to the bath while cleansing the skin.
- *Elder Flowers* relieve inflammation while toning and cleansing the skin
- *Lemon Balm Leaf* is calming and helps to induce sleep as well as relieve nervous agitation.
- *Rosemary Leaf* relieves fatigue and is a cleansing tonic for the skin.

➢ Interesting English measures to consider

WEIGHT		*VOLUME*	
1 pinch	2 g	1 l	20 drops
1 teaspoonful	5 g	5 l	1 teaspoonful
1 spoonful (tablespoon)	10 g	20 l	1 spoonful (tablespoon)
1 handful	35 g	150 l	1 glass/ 1 cup of tea
1 ounce	28.35 g	350 l	1 milk cup/ 1 bowl

PART VIII

ESSENTIAL OILS

* INTRODUCTION TO ESSENTIAL OILS *

Essential oils are compounds made up of several organic volatile substances. These may be alcohols, acetones, cetones, ethers, aldehydes, and are produced and stored in the secretion canals of plants.

At room temperature they are usually liquid. Given their volatility, they can be extracted using steam distillation, though other methods exist. On the whole, they are responsible for the aromas of plants.

According to AFNOR (the standards organization of France, 1998), they are defined as:

Products obtained from raw vegetable matter either by steam dragging or by mechanized processes (epicarpium of citrus fruits) or by dry distillation. The essential oil is later separated in the aqueous phase, using physical methods in the first two cases. They are able to undergo physical treatment without important changes in composition (re-distilling, airing).

This definition clearly establishes the differences there are between medicinal essential oils and other aromatic substances used in pharmacy and perfumery which are commonly known as essences.

Essential oils are widely distributed in nature and are found in conifers (pine, fir), myrtaceae (eucalyptus), rutaceae (citrus spp), compounds (camomile), although the majority of plants with essential oils are found in the labiatae (mint, lavender, thyme, rosemary) and umbelliferous (aniseed) families.

They are found in different organs: roots, ryzomes (ginger), wood (camphor), leaf (eucalyptus), flowering parts (Labiatae family).

Composition depends on place of origin. The habitat where the plant grows (normally warm climates have more essential oils), the moment of harvesting, extraction methods, etc are also important.

Among the main therapeutic properties of essential oils antiseptics stands out (for many years these spices have been added to foodstuffs not just for flavouring but to help preserve them).

Other properties are: antispasmodic, expectorant, carminative, eupeptic.

It is necessary to bear in mind that certain essential oils, especially in high doses, may be toxic to the central nervous system in particular. Others, such as rue or juniper have abortive properties.

Others may cause skin problems, rashes or allergies In addition to having therapeutic properties, essential oils are widely used in the pharmaceutical, food, and perfume (especially) industries

http://roberttisserand.com/about/essential-oils/

∗ ESSENTIAL OILS CLASSIFICATION ∗

Essential oils may be classified using different criteria: consistency, origin, and chemical nature of the main components.

❖ Depending on their **consistency**, essential oils are classified as :a) *essences*; b) *balsams*; c) *resins*.

Fluid essences are liquids which are volatile at room temperature. ***Balsams*** are natural extracts obtained from a bush or tree. They usually have a high benzoic and cynamic acid content with their corresponding esthers. They are thicker, not very volatile, and less likely to react by polymerising. Within the ***resin*** group we find a number of possible combinations and mixes:

1. Resins are amorphous solid or semi-solid products of a complex chemical nature. They are physiological or physio-pathological in origin. Colophony, for example, is obtained by separating trementine an oleoresin. It contains abietic acid and derivates.

2. Oleoresins are homogeneous mixes of resins and essential oils. Trementine, for example, is obtained by making incisions in the trunk of different pine species. It contains resin (colophony) and essential oil (trementine essence) which are separated by steam drag distillation.

The term *oleoresin* is also used to refer to vegetable extracts obtained using solvents, which should be virtually free of said solvents. They are frequently used instead of spices in foodstuffs and pharmacy because of their advantages (stability, microbiotic and chemical uniformity, and easy to add). They have the aroma of the plant in concentrated form and are highly viscous liquids or semi-solid substances (black pepper, paprika oleoresin, cloves).

3. Gum-resins are natural plant or tree extracts. They are a mix of gums and resins.

❖ Depending on their **origin**, essential oils are classified as: a) natural; b) artificial; c) synthetic.

Natural oils are obtained straight from the plant and are not modified physically or chemically afterwards. However, they are expensive because of their limited yield.

Artificial oils are obtained using processes of enriching the essence with one or several of its components. For example, essences of rose, geranium, and jasmine are enriched with linalool, and aniseed essence with athenol.

Synthetic oils, as the name suggests, are usually produced by combining their chemically synthesised components. These are the cheapest and are thus much more commonly used as fragrance and taste enhancers (vanilla, lemon and strawberry essences).

❖ Chemical nature

The total essential oil content of a plant is generally low (less than 1%). However, by extraction we obtain a highly concentrated form which is used in industrial processes. Most of these are highly complex chemical compounds. The proportion of these substances varies depending on the oil, but also on season, time of day, growing conditions, and genetics.

The term chemotype refers to the variation in chemical composition of an essential oil, even of the same species. A chemo-type is a distinct chemical entity, different from secondary metabolites. Certain small variations in the environment, geographical location, genes) which have little or no effect on a morphological level can, however, produce big changes in chemical phenotypes.

Thyme (Thymus vulgaris) is a typical example. It has 6 different chemo-types depending on which is the main component of its essence (timol, carvacrol, linalool, geraniol, tuyanol -4, or terpineol). When this is the case, the plant is named using the name of the species followed by the main component of its chemo-type. For example, Thymus vulgaris linalool, Thymus vulgaris timol.

http://www.100pureessentialoils.com/pages/eo-classifications.html

***Expanding Your Vocabulary*:**

artificial - not natural or real : made, produced, or done to seem like something natural

esther - chemical compounds derived from an inorganic acid or organic acid in which at least one -OH (hydroxyl) group is replaced by an -O-alkyl (alkoxy) group

resins - a yellow or brown sticky substance that comes from some trees and that is used to make various products; an artificial substance that is similar to natural resins and that is used to make plastics

trunk - The main woody stem of a tree as distinct from its branches and roots.

viscous - thick or sticky; not flowing easily (liquid)

⁎ PHYSICAL PROPERTIES OF ESSENTIAL OILS ⁎

Essential oils are volatile and become liquid at room temperature. When distilled they are at first colourless or slightly yellowish. They are less dense than water (sassafras essence and clove essence being exceptions). They are nearly always rotational and have a high refractory index. They are soluble in alcohol and in the usual organic solvents, such as ether or chloroform, and also in high grade alcohol.

⁎ CHEMICAL PROPERTIES OF ESSENTIAL OILS (TERPENOIDS) ⁎

Essential oil components are divided into *terpenoids* and *non-terpenoids*.

Non-terpenoids. This group contains short-chain aliphatic substances, aromatic substances, nitrogenated substances, and substances with sulphur. They are less important than terpenoids in terms of uses and applications.

Terpenoids. These are more important commercially and in terms of their properties. Terpenes are derived from isoprene units (C_5) bonded in a chain.

Terpenes are a type of chemical substance found in essential oils, resins, and other aromatic plant substances, (pines, citrus fruits). They are usually found in monoterpene oils (C_{15}) and diterpenes (C_{20}). They may be aliphatic, cyclic, or aromatic.

According to their function group they can be:

- Alcohols (menthol, bisabolol) and phenols (timol, carvacrol)
- Aldehydes (geranial, citral) and cetones (camphor, thuyone)
- Esthers (bornile acetate, linalile acetate, methyl salicilate, anti-inflammatory compound similar to aspirin)
- Ethers (1.8 - cineol) and peroxides (ascaridol)
- Hydrocarbons (limonene, pinene α and β)

http://www.chem.qmul.ac.uk/iupac/class/terp.html

DID YOU KNOW?

- Over 95% of the oils that are commercially available are for flavoring food or providing a fragrance. They are not therapeutic grade essential oils.
- Essential oils are different than fatty oils. While fatty oils are only needed until a new plant is able to produce its own food, essential oils are "essential" to the ongoing life of the plant.

FUNCTIONAL GROUPS OF ESSENTIAL OILS

COMPOUND	***EXAMPLE***	***PROPERTIES***
alcohol	menthol, geraniol	antimicrobe, antiseptic, tonic, spasmodic
aldehyde	citral, citronelal	spasmodic, sedative, antiviral
cetona	camphor, tuyona	mucolitic, regenerator cellular, neurotoxic
esther	methyl salicilate	spasmodic, sedative, antifungal
ethers	cineol, ascaridol	expectorant, stimulant
phenolic ether	safrol, anetol, miristicine	diuretic, carminative, stomach, expectorant
phenol	timol, eugenol, carvacrol	antimicrobes; irritant; stimulant (imunological)
hydrocarbons	pinene, limonene	stimulant, decongestant antiviral, antitumoral

⁎ OBTAINING ESSENTIAL OILS ⁎

The majority of essential oils are obtained through two main methods: *distillation* and *expression*, the latter works for citrus oils like orange, lemon and lime (the rind is pressed, squeezing the oil out), but the majority of the rest of the essential oils come from some sort of distillation either water or steam.

Steam drag distillation

The plants are placed on a perforated base or sieve at a certain distance over a distilling tank. The tank contains water at a level less than the depth of the sieve. Heating is via saturated steam when the water is heated using an in-built heater. The steam flows at a low pressure and penetrates the vegetable matter. The component parts volatilise and are then condensed in a refrigeration tube and collected in a Florentine flask where water and oil are separated because of difference in density.

Pericarpium squeezing

This consists of a tray with spikes on it and a channel underneath to collect essential oils. It is usually used for citrus fruits.

Solution in fats (enfleurage)

Oils are soluble in fats and high grade alcohols. A thin film of fat is placed on a glass plate and flower petals are then spread over it. The essence passes into the fat until saturated. Then the essential oil is extracted using 70% proof alcohol. It is used for flowers with a low but prized essential oil content (roses, violets, jasmine, orange blossom).

Extraction using organic solvents

These penetrate the vegetable matter and dissolve substances, which are then evaporated and concentrated at low temperature. Then the solvent is eliminated, leaving only the fraction wanted.

When choosing a solvent to dissolve all the ingredients quickly while dissolving the minimum amount of inert matter. It should have a low and even boiling point so that it can quickly be eliminated, though this should not cause ingredient losses. It should be chemically inert, so as not to react with the components in the oils, non-flammable, and cheap.

This ideal solvent does not exist, and petroleum ether (boiling point between 30 and 70 degrees, flammable, easy to evaporate), benzene (which also dissolves waxes and pigments), and alcohol (soluble in water) are commonly used. Alcohol is used when there are components with a high molecular weight but which are not volatile enough.

Extraction using gases in super-critical conditions

Gases (usually CO_2) at a temperature and pressure above their critical points) are used. In these conditions, yield is good and changes in the components of the essential oils can be avoided. The necessary infrastructure is expensive, but has its advantages, such as the rapid elimination of the extractor gas by decompression, the absence of solvent residue, and the fact that gases are not expensive.

Rectification

When an essential oil contains any impurities, it can be purified by re-distillation - either in steam or in a vacuum, and this purification by re-distillation is referred to as rectification.

This is the most common process. It consists in fractioning in a rectification column so as to obtain portions which are then analysed separately. Those of the same quality are mixed together. On the whole,

essential oils are fractioned into three parts: 1) top or light part; 2) heart or middle part; 3) heavy fraction.

Fractioning

This is similar to the above but the split is more specific. Essential oils with a 60 - 70% citral content are fractioned to try and eliminate other components so as to obtain 90-97% purity.

Deterpening

When terpenes are eliminated (if they do not have the organo-leptic properties needed) the essential oil becomes more soluble in water, and smell and colour are concentrated.

Dewaxing

When an essential oil is extracted by squeezing rather than steam distilling, it contains compounds such as the wax from the epicarpia of the fruit (as well as volatile terpenic fraction).

Filtering

Raw essential oils are filtered using filtering soils or other materials which retain residual water (anhydrous sodium sulphate, magnesium carbonate). It eliminates impurities.

Chemical reactions

To obtain new aromatic products of a better quality or value, with pleasanter sensations, it is possible to use:

- Estherification (cedar, vetiver, and mint).
- Hydrogenation (citronella).
- Hydration (trementine)

Discolouring

It is used for essences with bright colours. (Patchouli, Bursera graveolens, Clove).

Washing

The oil is washed with a 1% sodium hydroxide or 10% sodium carbonate solution eliminating unpleasant smell caused by the presence of acids and phenols.

Standardising

Not being an industrial process in itself it arises from the need to homogenize or normalize the quality of a product, because of the many variables which modify its characteristics. It is carried out to comply with industrial

requirements: same characteristics whatever the origin, time of the year, harvest time.

Isolating specific products

Some essences are commercialised to isolate some of their main components, such as eugenol (essence of clove) or cedrol (essence of cedar).

http://health.howstuffworks.com/wellness/natural-medicine/aromatherapy/how-essential-oils-work1.htm

***Expanding Your Vocabulary*:**

comply - meet specified standards
dewaxing - remove wax from
drag - the action of pulling something forcefully or with difficulty
film - a thin layer covering a surface:
flammable - easily set on fire:
flask - a narrow-necked glass container, typically conical or spherical, used in a laboratory to hold reagents or samples.
inert - lacking the ability or strength to move:
rectify - to purify (as alcohol) especially by repeated or fractional distillation
sieve - a device with meshes or perforations through which finer particles of a mixture (as of ashes, flour, or sand) of various sizes may be passed to separate them from coarser ones, through which the liquid may be drained from liquid-containing material, or through which soft materials may be forced for reduction to fine particles
spike - a thin, pointed piece of metal, wood, or another rigid material.
split - remove or be removed by breaking, separating, or dividing
squeeze - extract (liquid or a soft substance) from something by compressing or twisting it firmly:
tank - a container for holding a liquid or gas
terpenes - any of various isomeric hydrocarbons $C_{10}H_{16}$ found present in essential oils (as from conifers) and used especially as solvents and in organic synthesis
tray - a flat, shallow container with a raised rim, typically used for carrying food and drink, or for holding small items or loose material:

⁎ USES OF ESSENTIAL OILS ⁎

Food industry

They are used to season or condiment meats, dried and cured meats, soups, ice-cream, cheese. The most commonly used essential oils are

cilantrum, orange, and mint. They are also used in the elaboration of alcoholic and soft drinks, especially the latter. The essences of orange, lemon, mint and fennel are also used in the making of sweets and chocolates.

Pharmaceutical industry

They are used in toothpastes (mint and fennel essences), analgesics, and decongestant inhalers (eucalyptus). Eucalyptol is also widely used in dentistry. They are used in many medicines to neutralise unpleasant tastes (essence of orange or mint, for example).

Cosmetic industry

This industry uses essential oils to make cosmetics, soaps, scents, perfumes, and make-up. Geranium, lavender, roses and patchouli essences should be mentioned as common examples.

Veterinary product industry

This industry uses the essential oil of the Chenopodium ambrosoides, which is highly prized for its ascaridol (worm-killer) content. Limonene and menthol are also used to make insecticides.

Herbal veterinary products are better than chemical cure:

- Creates long term immunity on regular usage. No withdrawal period before slaughter;
- Easily available and cost effective being natural source ;
- No toxicity or residues in meat;
- No chemical residue in meat and produce better taste of meat;
- Do not show any teratogenic effect during pregnancy;
- Environment friendly in nature;
- Higher stability;
- Do not show any drug resistance activity against etiology;
- Help regulate metabolism naturally. Growth promoters and metabolic modifiers;
- Best preventive therapy if used as feed additive for regular consumption;
- Best remedies for disease at acute stages;
- Best supportive therapy in chronic stage, if used with other treatments;
- No adverse effects on hormonal secretion;
- Herbs used as prebiotics. Herbal therapies focus on the root causes , more than the symptoms of degenerative diseases;
- No adverse/ side effect in body;

- Show complimentary effect with substances present inside the body.
- Dosage inside the body are self adjustable;
- No hyper-sensitivity reaction;
- Easy to utilize by the body cells;
- No bad odor and easy to feed animals (same nature as feed ingredients).

Industrial deodorants

At present, the use of essences to disguise the unpleasant smell of industrial products like rubber, plastic and paint is being developed. Paint manufacturers use limonene as a biodegradable solvent. Toys are also scented. In the textile industry they are used to mask unpleasant smells before and after dyeing. In paper manufacture, products such as notebooks, toilet paper, and face wipes are scented.

Tobacco industry

It requires menthol for mentholated cigarettes.

Biocides and insecticides

There are certain substances such as thyme, cloves, salvia, mint, oregano, pine with bactericidal properties. Others are insecticides:

- ❖ against ants: Mentha spicata (spearmint), Tanacetum y pennyroyal.
- ❖ against aphids: garlic, other Allium, coriander, aniseed, basil.
- ❖ against fleas: lavender, mints, lemongrass, etc.
- ❖ against flies: rue, citronella, mint, etc.
- ❖ against lice: Mentha spicata, basil, rue, etc.
- ❖ against moths: mints, Hisopo, rosemary, dill, etc.
- ❖ against coleoptera: Tanacetum, cumin, wormwood and thyme, etc.
- ❖ against cockroaches: mint, wormwood, eucalyptus, laurel, etc.
- ❖ against nematods: Tagetes, salvia, calendula, Asparagus, etc.

http://ocw.upm.es/ingenieria-agroforestal/industrial-utilization-of-medicinal-and-aromatic-plants/

***Expanding Your Vocabulary*:**

ant - a small insect typically having a sting and living in a complex social colony with one or more breeding queens.

aphid - a small bug which feeds by sucking sap from plants; a blackfly or greenfly.

coleopteran - an insect of the order Coleoptera; a beetle.

disguise – to give (someone or oneself) a different appearance in order to conceal one's identity, camouflage, mask

dye - a natural or synthetic substance used to add a colour to or change the colour of something

elaboration - to give more details about something; to work out in detail

flea - a very small insect that lives on animals and that has strong legs used for jumping

make-up - substances (such as lipstick or powder) used to make someone's face look more attractive

moth - a kind of insect that is similar to a butterfly but that flies mostly at night and is usually less colorful

solvent - that dissolves or can dissolve; a liquid, typically one other than water, used for dissolving other substances.

DID YOU KNOW?

- The aroma of eucalyptus oil varies depending on 1.8cineol content: the oil with a high content (*Eucalptus globulus*) is used for medicinal purposes, whereas that with a lower content (*Eucaliptus radiata*) is used in aromatherapy.
- Safrol is a component which is used extensively in the perfume industry and is found in the bark of the sassafras tree (*Sassafras albidum* Lauraceae family).
- Phenolic Ethers are the main components of species such as celery and parsley (apiol), aniseed (anetol), basil (metilchavicol), and estragon (estragol).
- Phenols are only found in a few species but are very powerful and irritating.
- Alcohols have the hydroxile group (OH) bonded to a C_{10} skeleton. Their names end in *–ol.* They are highly sought after for their aroma.
- Like gold, essential oils have been around for thousands of years. And like gold, essential oils experience occasions when they appear to draw little interest or are virtually unknown. But, also like gold, the interest in essential oils surges when people are looking for reliability and value.

PART IX

STANDARDS AND QUALITY CONTROL. CONSTRAINTS

"Quality is more important than quantity."

— Steve Jobs

"Quality means doing it right when no one is looking."

— Henry Ford

"Quality in a product or service is not what the supplier puts in. It is what the customer gets out and is willing to pay for. A product is not quality because it is hard to make and costs a lot of money, as manufacturers typically believe. This is incompetence. Customers pay only for what is of use to them and gives them value. Nothing else constitutes quality."

— Peter F. Drucker

⁎ STABILITY AND DURATION ⁎

By stability it is meant the amount of time an active ingredient keeps in certain conditions, each raw material having a different period of stability. Producers must enclose a technical information sheet with the raw material, describing how it was obtained and treated. The following facts should be included:

a) harvesting;
b) Latin name and variety of the plant;
c) part of the plant used;
d) place of origin;
e) growing and harvesting methods;
f) time of harvesting and vegetative state of the plant at the time;
g) drying;
h) drying method, temperature and time of exposure;
i) storage;
j) conditions and duration of storage;
k) packing materials;
l) transport;
m) duration and conditions of transporting the product;

n) treatment;

o) phytosanitary treatments: products used, how and when

The producer and distributor may send their suppliers a questionnaire or even visit a supplier to check about: organisation; staff; installations; equipment; documents and paperwork; work methods; flow of materials; quality control; production; store.

This information is essential to establish a quality guarantee for the raw material, and to establish trust in suppliers. It also gives a complete picture of processes.

http://ocw.upm.es/ingenieria-agroforestal/industrial-utilization-of-medicinal-plants/

⁎ GENERAL HERBAL QUALITY CONTROL GUIDLINES ⁎

Herbalists universally agree that herb quality is the single most important factor in determining whether an herbal product is effective. Here are some general guidelines concerning this important issue.

1. Leave herbs in their whole state as long as possible (until just before encapsulation). because:

- Oxygen is the most powerful force in degrading quality
- Easier to identify adulterants
- Easier to observe mound, dirt, overall color, freshness

2. Use smell, taste to identify primary flavor components of herb. If devoid of flavor, e.g. astringent and bitter for willow bark, reject lot.

3. Observe color of herb. Red clover blossoms should be red - not brown. Chickweed and other leafy herbs should be green.

4. Watch for mould. If a sample is black or grey-mottled and smells musty or moldy, reject. Mound is a result of excess moisture and improper drying methods. All of these factors degrade the activity of the herb dramatically. Any succulent plants are more susceptible than others to mound. Primary examples are Chickweed and Gotu Kola.

5. Keep and compare vouchered sample in pint glass jar with incoming lots.

6. Use microscopic analysis where doubt exists.

7. Watch insoluble ash content of herb. Many of the roots that are sold through major root dealers are just pulled up out of the ground and shipped as it is. Some careless collectors like to sell the roots with lots of dirt, because it means less processing (washing) for them, as well as adding to the weight.

http://www.healthy.net/scr/article.aspx?Id=957

Expanding Your Vocabulary

ash – residue, dust, powder

voucher - a piece of supporting evidence, a document serving as evidence for some claimed transaction, as the receipt or expenditure of money, a document, receipt, stamp, etc., that gives evidence of an expenditure.

adulterants – contaminants, pollutants, additives

astringent – severe, harsh

encapsulation - to show or express the main idea or quality of (something) in a brief way

moldy – dirty, covered with a mold-producing fungus

mottle - a surface having colored spots or marks

mound - a small hill or pile of dirt or stones

musty - having a bad smell because of wetness, old age, or lack of fresh air

⁎ DOCUMENTATION OF MEDICINAL PLANTS QUALITY, SAFETY AND EFFICIENCY IN EU ⁎

A marketing authorization for a herbal medicinal product is, in principle, granted based on an extensive dossier in terms of quality, safety and efficacy proof in all countries, with the exception of Denmark and Finland, where it is possible to use only references to published data for herbal medicinal products. Luxembourg, in practice, only grants marketing authorization based on the assessment of other countries. In principle, according to Article 4.8 of Council Directive (European Commission, 1965), the option of using reviews on published data is available in all Member States. However, this 'bibliographical' option is sometimes only available through assessment on a case-by-case basis or not used in practice. Austria permits this type of application for safety documentation only.

All Member States apply the manufacturing requirements of Council Directive (European Commission, 1975) to herbal medicinal products. Starting materials for herbal medicinal products are in principle controlled in accordance with the European Pharmacopoeia in all Member States. Good manufacturing practice inspections are carried out in nearly all Member States. The European Pharmacopoeia was created in 1964; its efforts have resulted in the creation of 83 monographs on herbal drugs which are used either in their natural state after desiccation or concentration or for the isolation of natural active ingredients (Council of Europe, 1996).

http://monographs.iarc.fr/ENG/Monographs/vol82/mono82-6A.pdf

Expanding Your Vocabulary

authorization – approval, support
desiccation – to dry up or cause to dry up; to preserve (a food) by drying
dossier - a group of papers that contain detailed information about someone or something
grant – allowance; to give (something) legally or formally
permit – allow, make something possible
proof - used in proving or testing or as a standard of comparison

∗ STANDARDS AND QUALITY CONTROL IN INDIA ∗

The single most important factor which is standing in the way of wider acceptance of drugs based on medicinal plants is non-availability or inadequacy of standards to check or test the quality by modern instrumentation methods. A serious thought needs to be given to this aspect.

Government of India has set up pharmacopoeial committees for traditional and Homoeopathy systems. The Pharmacopoeial Laboratory for Indian Medicines (PLIM) and the Homoeopathy Pharmacopoeial Laboratory (HPL) are providing the technical back up these committees.

The Ayurvedic Formulary of India published by the Ministry of Health and Family Welfare, Government of India, contains 634 formulations involving 500 medicinal plants. Of these, standards for 80 single plant drugs have been include in the first part of Ayurvedic Pharmacopoeia of India, 78 plant in second part and 100 plants are included in third part of Ayurvedic Pharmacopoeia of India. One hundred and thirty seven plants have been allocated to 24 research /academic institutions for preparing monographs on their standardization. The Central Council for Unani Medicines has published two volumes on single plant drug standardization covering 100 medicinal plants. The Unani pharmacopoeia committee has published one national formulary of 441 formulations of Unani medicines. Now 45 monographs on single Unani drugs have been published. The Siddha pharmacopoeia committee has brought out seven volumes containing standards of 910 drugs.

Under the sponsorship of the Indian Drugs Manufacturers Association (IDMA), Regional Research Laboratory Jammu has developed standards for 38 herbal drugs (in two volumes).

The next stage is the quality control during processing and manufacturing. The Government of India in the Department of ISM&H has notified elaborate Good Manufacturing Practices only recently. This is a very important step, which will ensure quality during the manufacturing process.

But there are some constraints preventing further development of standard and quality system of medicinal plants in India. They are:

1) Depletion of the resource-base, which is the foundation of entire sector.

2) Decline of folk traditional medicines, a source of primary health care for an estimated 800 million people in the country.

3) Impoverishment of rural people, who are stewards of the resource base and the holders of traditional ecological and medical knowledge, through inequitable marketing channels.

4) Medicinal plants trade is inefficient, imperfect, informal and opportunistic.

5) Crude drug supply situation is shaky, unsustainable, and exploitative and adulteration taking place.

6) Deficient toxicology studies and standard preparations to improve the quality, efficacy and effectiveness of the traditional drugs.

7) Unsustainable wild harvesting.

8) Lack of coordination amongst various stakeholders such as Govt. of India (Ministry of Agriculture, Environment &Forests, ISM&H, Science and Technology etc.) State Governments, Private traditional medicine sector, research institutes, NGOs, International Networks etc.

http://www.eplantscience.com/index/medicinal_plants/

Expanding Your Vocabulary

adulteration – contamination, pollution

ayurvedic - a form of holistic alternative medicine that is the traditional system of medicine of India; Sanskrit *āyurvedaḥ*, from *āyuḥ* life, vital power + *vedaḥ* knowledge

constraint - limitation or restriction

depletion - reduction

formulary - a book listing medicinal substances and formulas

impoverishment - make (a person or area) poor; poverty

inequitable - unfair; unjust, unequal, discriminatory

ISM&H - Indian systems of medicine and homoeopathy

research - careful study that is done to find and report new knowledge about something

shaky - unstable

Siddha - usually considered as the oldest medical system known to mankind originated in Southern India

stewards - a person whose responsibility it is to take care of something:

Unani - a traditional system of healing and health maintenance observed in South Asia

volume - a series of printed sheets bound typically in book form; a series of issues of a periodical

DID YOU KNOW?

- ❖ The principal tool for monitoring or restricting trade of species threatened by over-exploitation is the Convention on International Trade of Endangered Species of Wild Fauna and Flora, or CITES, which entered into force in 1975. The 158 national governments who currently have signed CITES are obliged to monitor and control international trade in the plants and animals listed in its two main Appendices.
- ❖ Herbs are trophorestorative, which means they work on the deepest level to bring about vitality and healing. It has been found, through scientific research, that plants benefit people by actually transferring information to bodies on a genetic level. Now, that's called deep healing!
- ❖ Essential oils should be kept out of reach of children. It is also advisable to fit bottles that don't have a dripolator (orifice reducer) with a child proof cap for safety reasons.
- ❖ The United State Pharmacopoeia (USPC) was first established in 1830 to bring standards for medicinal preparations of any kind. The National Formulary (NF) was set up to set codes for the inactive ingredients that are used in medicine. Today, these organizations have merged and publish a book the USP-NF "Red Book" that provides the FDA (Food and Drug Administration) enforceable standards for quality and strength of health care products.
- ❖ The US National Formulary (NF) is currently looking at standards for distilling, growing and packaging of essential oils in hopes to incorporate them in this book. It would really help minimize much of the fraud that is associated with essential oils, especially in the United States.

PART X

MEDICINAL PLANTS: PRESENT AND FUTURE

“People have forgotten this truth," the fox said. "But you mustn’t forget it.
You become responsible forever for what you’ve tamed.
You’re responsible for your rose.”

Antoine de Saint-Exupéry, The Little Prince

⁎ LOCAL HERITAGE WITH GLOBAL IMPORTANCE ⁎

Medicinal plants are the local heritage with global importance. World is endowed with a rich wealth of medicinal plants, the latter have always been the principal form of medicine in India and presently they are becoming popular throughout the developed world, as people strive to stay healthy in the face of chronic stress and pollution, and to treat illness with medicines that work in concert with the body's own defense. People in Europe, North America and Australia are consulting trained herbal professionals and are using the plant medicines. Medicinal plants also play an important role in the lives of rural people, particularly in remote parts of developing countries with few health facilities.

Medicinal plants are living and irreparable resource, which is exhaustible if over used and sustainable if used with care and wisdom. The importance of medicinal plants has been overlooked in the past. However, at present medicinal plants are looked upon not only as a source of affordable health care but also as a source of income. According to WHO report, over 80% of the world population relies on traditional medicine largely plant based for their primary healthcare needs

The forest areas have been the traditional source of medicinal plants and herbs. The position cannot be sustained much further because on the one hand the areas under forests have been steadily shrinking and on the other the requirement of medicinal plants and herbs has increased sharply. This has resulted in unscientific and over exploitation of medicinal plants in the forests. One indication of the scarcity of some medicinal plants is their steep prices. The Ministry of Environment and Forests have already banned 29 endangered species of medicinal plans from their natural habitat. While medicinal plants are being utilized in the preparation of a number of modern drugs, there is a new trend worldwide of using natural products. Besides

medicinal values, Pharmaceuticals, herbal food supplements, toiletries and cosmetics are growing in consumption in the international market.

During the past one century there has been a rapid extension of the allopathic system of medical treatment in India which generated commercial demand for pharmacopoeial drugs and their products in India. Efforts have been made to introduce many of these drug plants to farmers. Several research institutes have undertaken studies on the cultivation practices of medicinal plants, which were found suitable and remunerative for commercial cultivation. The agronomic practices for growing poppy, isabgol, senna, cinchona, ipecac, belladonna, ergot and few others have been developed and there is now localized cultivation of these medicinal plants commercially.

http://www.eplantscience.com/index/medicinal_plants/present_and_future/present_and_future.php

Expanding Your Vocabulary:

endow – donate, give, provide
heritage – tradition, custom
irreparable – permanent, lasting; impossible to cure or repair:
remunerative - providing payment or other rewards for work that has been done
steep - rising or falling sharply; almost perpendicular:
strive – struggle, try, do your best

⁎ DOMESTIC MARKET OF MEDICINAL HERBS IN INDIA ⁎

Medicinal plants market in the country is today unorganized due to several problems. Medicinal plants are a living resource, exhaustible if overused and sustainable if used with care and wisdom. Current practices of harvesting are unsustainable and many studies have highlighted depletion of resource base. Many studies have confirmed that pharmaceutical companies are also responsible for inefficient, imperfect, informal and opportunistic marketing of medicinal plants. There is a vast, secretive and largely unregulated trade in medicinal plants, mainly from the wild, which continues to grow dramatically in the absence of serious policy attention materials where the origin of a particular drug is assigned to more than one plant, due to which; adulteration is common in such cases. All these affect the market both directly and indirectly.

They further indicated that marketing is daunting problem, which bests the development of the plant-based industry in developing countries. Marketability of products will be a crucial factor in determining the failure or success of this sector. The market outlets can be for local use and for export.

As for local use some products could reach the consumer directly while others have to be either further processed or used as secondary components in other industrial products. A clear understanding of both the supply-side issues and the factors driving the demand and size of the medicinal plants market is a vital step towards planning for both the conservation and sustainable use of the habitats of these plants as well as for ensuring continued availability of the basic ingredients used to address the health needs of the majority of the world's population.

http://www.eplantscience.com/index/medicinal_plants/present_and_future/present_and_future.php

Expanding Your Vocabulary:

assign – allocate, give, disperse
crucial - of great importance:
daunting - tending to make people afraid or less confident; very difficult to do or deal with
outlet - a point from which goods are sold or distributed:

⁎ MEDICINAL HERBS GLOBAL MARKET ⁎

According to the report of the World Health Organisation (WHO), a large population of the world relies on the traditional systems of medicines, largely plant based to meet their primary health care needs.

The high costs of western pharmaceuticals put modern health care services out of reach of most of the world's population, which relies on traditional medicine and medicinal plants to meet their primary health care needs. Even where modern medical care is available and affordable, many people prefer more traditional practices. This is particularly true for First Nations and immigrant populations, who have tended to retain ethnic medical practices.

In the last decade, there has been considerable interest in resurrecting medicinal plants in western medicine, and integrating their use into modern medical systems. The reasons for this interest are varied, and include:

- ✓ *low cost*: herbals are relatively inexpensive and the cost of pharmaceuticals to governments and individuals is rising
- ✓ *drug resistance*: the need for alternative treatments for drug-resistant pathogens
- ✓ *limitations of medicine*: the existence of ailments without an effective pharmaceutical treatment
- ✓ *medicinal value*: laboratory and clinical corroboration of safety and efficacy for a growing number of medicinal plants

- ✓ *cultural exchange*: expanding contact and growing respect for foreign cultures, including alternative systems of medicine
- ✓ *commercial value*: growing appreciation of trade and other commercial economic opportunities represented by medicinal plants

The EXIM bank of India, in its report has stated the value of medicinal plants related trade in the India of the order of 5.5 billion US dollar and is growing rapidly. Accordingly to WHO, the international market of herbal products is estimated to be US $ 62 billion which is poised to grow to US $ 5 trillion by the year 2050. India's share in the global export market of medicinal plants related trade in less than 0.5%. The Chinese export based on plants including raw drugs, therapeutics and other is estimated to be around Rs. 18,000 - Rs. 22,000 crores. In view of the innate Indian strengths which interalia include diverse eco-systems, technical and farming capacity and a strong manufacturing sector, the medicinal plants area can become a huge export opportunity after fulfilling domestic needs.

A part from requirement of medicinal plants for internal consumptions, India exports crude drugs mainly to developed countries, viz. USA, Germany, France, Switzerland, UK and Japan, who share between them 75 to 80 percent of the total export of crude drugs from India. The principal herbal drugs that have been finding a good market in foreign countries are Aconite, Aloe, Belladonna, Acorns, Cinchona, Cassia tora, Dioscorea, Digitalis, Ephedra, Plantago (Isabgol), Cassia (Senna) etc.

http://www.eplantscience.com/index/medicinal_plants/present_and_future/present_and_future.php

Expanding Your Vocabulary:

corroboration - evidence which confirms or supports a statement, theory, or finding; confirmation

huge - extremely large; enormous

innate – distinctive, essential, characteristic

inter alia - among other things:

poise - a controlled and relaxed way of behaving, even in difficult situations; a graceful and calm way of moving, standing, or sitting

Rs - Rupee(s) - the basic monetary unit of India, Pakistan, Sri Lanka, Nepal, Mauritius, and the Seychelles, equal to 100 paise in India, Pakistan, and Nepal, and 100 cents in Sri Lanka, Mauritius, and the Seychelles.

viz. - *abbreviation formal – Latin* videlicet *for "*that is to say", namely - used, especially in writing, when you want to give more specific information about something that you have just mentioned

* DEVELOPMENT OF MEDICINAL PLANT SECTOR *

World Bank group have several project to support the cultivation of medicinal plants through various lending and non-lending initiatives, the World Bank is assisting the countries of South Asia to address these needs. Some of these efforts are, The Kerala Forestry Project, The Sri Lanka Medicinal Plants Project, Ritigala Community Based Development and Environment Management Foundation, The India Capacity Building for Food and Drugs Quality Control Project, etc. There is a need to launch number of projects for arid region of India.

Although the Bank has supported some pioneering work in the South Asia region related to medicinal plants and, more generally, natural resource management, much remains to be done. In the future, it will be important to mainstream medicinal plants and other non-timber forest products into natural resource management and development programs. To boost the quality of plant resource management and increase supplies of these resources:

- ✓ Agricultural support agencies should strengthen extension efforts to farmers;
- ✓ Research institutions need to improve basic knowledge about cultivation practices and dissemination of plant species;
- ✓ Conservation agencies and NGOs should promote conservation of vulnerable species at the grass-roots level;
- ✓ Community organizations need to adopt sustainable collection and management practices on public lands;
- ✓ Profitable private enterprises for processing, transporting, and marketing must be developed;
- ✓ Government institutions need to be strengthened to regulate these important resources and, at the same time, foster their sustainable development and conservation.

Future initiatives should also link the management and conservation of medicinal plants (andother non-timber forest products) with the commercial development of these resources. In this spirit, every new forestry project should be designed to have a significant effect on the sustained use of non-timber forest products. Management and conservation must be integrated with programs in other sectors: in health, to foster better use of plant materials; in education, to build awareness of the need for protection and judicious development; and in agriculture, to strengthen farmer extension methods for plant cultivation.

The Bank's new lending instruments-learning and innovation loans and adaptable program loans-are well suited to these efforts. They can allow for project design flexibility to incorporate lessons learned, encourage

institutional reforms, and, where appropriate, foster pilot exercises to test new approaches. With the commitment of governments, local communities, and NGOs, united with international support, the medicinal plant resources of South Asia have a chance of surviving, thriving, and continuing to aid billions of people.

The Global Environment Facility (GEF) provides grant and concessional funds to developing countries and those with economies in transition for projects and activities that address four aspects of the global environment: biological diversity, climate change, international waters, and the ozone layer. Activities related to land degradation, primarily those addressing deforestation and desertification as they relate to the focal areas, are also eligible for funding. Along with the United Nations Development Programme and the United Nations Environment Programme, the World Bank is an implementing agency for the GEF.

http://www.eplantscience.com/index/medicinal_plants/present_and_future/present_and_future.php

Expanding Your Vocabulary:

arid - a very dry place without many plants because of a lack of rain

awareness - knowledge or perception of a situation or fact:

boost - improvement; help or encourage (something) to increase or improve

concessional - privilege; preference, relief; something conceded by a government or a controlling authority, as a grant; any grant of rights, land, or property by a government, local authority, corporation, or individual; a space or privilege within certain premises for a subsidiary business or service

dissemination - the act of spreading something, especially widely

extension - a program that geographically extends the educational resources of an institution by special arrangements (as correspondence courses) to persons otherwise unable to take advantage of such resources

foster - encourage the development of (smth. desirable)

judicious - showing intelligence and good judgment

launch – introduce, to give a start

loan - an amount of money that is given to someone for a period of time with a promise that it will be paid back : an amount of money that is borrowed

NGO - non-governmental organization: an organization which is neither a government department, nor a business operating for profit. NGOs

are often paid for by the government and may work with government departments, but they are independent of the government

spirit - the non-physical part of a person which is the seat of emotions and character; the soul; a volatile liquid, especially a fuel, prepared by distillation:

timber - trees grown for use in building or carpentry:

vulnerable - easily damaged by something negative or harmful

⁎INTERNATIONAL CONFERENCE ON MEDICINAL PLANTS⁎

International Conference on Medicinal Plants and Ayurveda was held 16th December, 2002 at India International Centre 40, New Delhi. The Conference was organized by UTTHAN (Centre for Sustainable Development and Poverty Alleviation) in association with RIFA (Russian-Indian Federation of Ayurveda). On Conclusion, the conference made following Recommendation. During the conference following issues were discussed:

- ✓ Policy and legal issues for the development of Ayurveda and medicinal Plants;
- ✓ Development of Medicinal Plants sector;
- ✓ Ayurvedic Drugs Development and Product Standardization;
- ✓ Globalization of Ayurveda and medicinal plant sector.

After a detailed discussion the conference made following recommendations:

- ❖ Ayurveda is a holistic health science, having diversity, flexibility, accessibility, affordability and have a potential to meet with the new challenges to human life;
- ❖ The concept of destress and detoxification packages of Ayurveda can largely solve psychosomatic problems;'
- ❖ Panchakarma and Yogic therapy are popular and health tourists visiting India should be treated well;
- ❖ The Ayurvedic treatments are simpler, gentler and cheaper and therefore to be popularized;
- ❖ The Ayurveda should play the major role in national health care system. Globalization of Ayurveda should be the goal;
- ❖ Ayurveda is the only medical science which gives equal stress to the preventive and curative aspects of health to be highlighted.

http://www.eplantscience.com/index/medicinal_plants/present_and_future/present_and_future.php

Expanding Your Vocabulary:

accessibility – convenience, availability, ease of access

Ayurveda - "life-knowledge"- a 5,000-year-old system of natural healing that has its origins in the Vedic culture of India

gentle – calm, tender

holistic – complete, all-inclusive

Panchakarma - the ultimate mind-body healing experience for detoxifying the body, strengthening the immune system, and restoring balance and wellbeing.

* DEVELOPMENT OF MEDICINAL PLANT SECTOR *

Demand for medicinal plants is rapidly increasing; therefore, organized cultivation of medicinal plant is urgently required for meeting the demand. While selecting the germplasm, standardization of toxicity, shelf-life of the product, the potency and the concentration has to be taken care of. Harvesting, drying and storage of medicinal plants must ensure the purity and safety against microbial contamination and quality deterioration. There should be a linkage between growers and pharmaceutical companies to ensure marketability of raw drugs.

Village level cultivation of medicinal plants should ensure health, nutritional and environmental security. Ayurveda community of the entire world should be brought under the single banner of a global federation for ayurvedic practitioners.

India should upgrade educational centers of Ayurveda to extend educational facility in India and abroad to interested people. India should produce quality ayurvedic medicine and make it available to different countries for utilization. Collaborative research should be encouraged between India and other countries for propagating Ayurveda. Panchakarma and Yoga therapy should be popularized in other countries.

India should prepare a website to provide all the required data in Ayurveda such as GMP regulations, R & D findings, raw material standardization, trade and market information and other things relevant for the global community.

http://www.eplantscience.com/index/medicinal_plants/present_and_future/present_and_future.php

<u>Expanding Your Vocabulary:</u>

collaborative - produced by or involving two or more parties working together

GMP - Good Manufacturing Practices

shelf-life - the length of time for which an item (product) remains usable, fit for consumption, or saleable:

under the banner of something - used when naming the organization that controls or supports a particular activity

⁎ PRODUCTS STANDARDIZATION ⁎

For popularizing ayurvedic medicine it is necessary to promote (a) standardization, (b) safety, (c) quality, (d) integrity and (e) authenticity of the practices and the products.

At least one drug for each major disease should be identified and the manufacturing process, standard, quality and clinical trial should be completed within stipulated period.

Good Manufacturing Practices (GMP) should be adopted while manufacturing Ayurvedic medicines.

There should be State Drug Testing Laboratory to check the quality and standard of Ayurvedic medicines.

All pharmacies should have a research and development activity at least to provide rationale to the products they want to sell in the market.

Ayurvedic industry should incorporate the latest advances of science and technology in the manufacturing process and clinical practices.

Ayurvedic industries should be given "priority industry status" and declared as "green industry".

Guidelines should be framed for patent and proprietary medicines and manufacture to have efficacy and safety.

Priority would be recorded to research covering clinical trials, pharmacology, toxicology, standardization and study of pharmacology kinetics in respect of identified drugs.

http://www.eplantscience.com/index/medicinal_plants/present_and_future/present_and_future.php

Expanding Your Vocabulary:

authenticity - true and accurate; worthy of acceptance
frame – border, limit, boundary
guidelines - A statement or other indication of policy or procedure by which to determine a course of action
integrity – truth, honesty, reliability
kinetics - a branch of science that deals with the effects of forces upon the motions of material bodies or with changes in a physical or chemical system
proprietary - owned by a person or company and sold under a trademark or patent
stipulate – specify,
trial – test, experiment, investigate,

∗ STRATEGY FOR PLANT CONSERVATION ∗

Of urgent concern is the fact that many plant species, communities, and their ecological interactions, including the many relationships between plant species and human communities and cultures, are in danger of extinction, threatened by such human-induced factors as, inter alia, climate change, habitat loss and transformation, over-exploitation, alien invasive species, pollution, clearing for agriculture and other development. If this loss is not stemmed, countless opportunities to develop new solutions to pressing economic, social, health and industrial problems will also be lost. Furthermore, plant diversity is of special concern to indigenous and local communities, and these communities have a vital role to play in addressing the loss of plant diversity.

If efforts are made at all levels to fully implement this updated Strategy:

- ✓ societies around the world will be able to continue to rely upon plants for ecosystem goods and services, including food, medicines, clean water, climate amelioration, rich, productive landscapes, energy sources, and a healthy atmosphere;
- ✓ humanity will secure the ability to fully utilize the potential of plants to mitigate and adapt to climate change recognizing the role of plant diversity in maintaining the resilience of ecosystems;
- ✓ the risk of plant extinctions because of human activities will be greatly diminished, and the genetic diversity of plants safeguarded;
- ✓ the rich evolutionary legacy of plant diversity will be used sustainably and benefits arising are shared equitably to solve pressing problems, support livelihoods and improve human well-being;
- ✓ the knowledge, innovations and practices of indigenous and local human communities that depend on plant diversity will be recognized, respected, preserved and maintained; and people everywhere will be aware of the urgency of plant conservation and will understand that plants support their lives and that everyone has a role to play in plant conservation.

The updating of the Strategy for the new decade was undertaken in parallel to the consultations leading to the adoption of the Strategic Plan for Biodiversity 2011-2020 and its implementation should be considered within the broader framework of the Strategic Plan for Biodiversity 2011-2020.

http://www.cbd.int/gspc/intro.shtml

DID YOU KNOW?

- ✓ Up to now, the practice of herbal medicine entails the use of more than 53,000 species, and a number of these are facing the threat of extinction due to overexploitation.
- ✓ Domestic and foreign markets for medicinal plants are growing rapidly and provide important opportunities for the development and diversification of Canadian agriculture. Currently, ginseng dominates the medicinal crops of Canada. Ginseng (including both the American and Asian species) is the world's most widely used medicinal plant, and Canada's most important medicinal crop, contributing about $100 million annually to the Canadian economy.
- ✓ When a plant is (or becomes) popular medicinally, its commercial value is likely to lead to over collection. Many very important Canadian drug plants grow in the shade of trees (for examples, ginseng, goldenseal, Mayapple, and Pacific yew) and, because they grow very slowly, are especially susceptible to over collecting. Such non-timber forest resources are of importance to the forest industry, which is looking for alternative crops.
- ✓ Plants are the miracle of our lives. They provide the oxygen we need to breath, the food we need to eat, and the beauty we need to see. They are truly wonderful. Actually, they even help reduce pollution in areas of high population! So be sure to treat them well!
- ✓ Cultivation offers the possibility of not only preserving economically important wild plants in their natural habitats, but also of providing farmers with new crops.
- ✓ Canadian farmers, entrepreneurs and pharmaceutical companies have increasingly been searching to exploit additional medicinal plants that can be grown in Canada, but have been limited by the difficulty of acquiring information on the many promising possibilities that exist.
- ✓ In September 1996, Health Canada made available a discussion paper entitled "Recommendations for defining and dealing with functional foods." This contained the following working definitions, which are far more restrictive than found in common usage: "A functional food is similar in appearance to conventional foods, is consumed as part of a usual diet, and has demonstrated physiological benefits and (or) reduces the risk of chronic diseases beyond basic nutritional functions." "A nutraceutical is a product produced from food but sold in pills, powders (potions) and other medicinal forms not generally

associated with food and demonstrated to have a physiological benefit or provide protection against chronic disease."

- ✓ At current extinction rates, experts estimate that the Earth is losing at least one potential major drug every two years.
- ✓ Habitat loss and unchecked commercialization of wild medicinal plants is threatening the future of vital resources, as well as the beauty, diversity, and natural heritage of our planet. As wildlands are destroyed or degraded, we lose unique and precious species, from flowers to frogs to butterflies, and with them potential resources to combat hunger, poverty, natural disasters, and social and economic insecurity. This loss of diversity may also take with it important cures for diseases — both those we face now and those that may emerge in the future. Unchecked commercialization may render important traditionally used medicinal plant resources inaccessible and unaffordable to populations that have relied on them for centuries — as well as to the rest of the world.

Expanding Your Vocabulary:

urgent – pressing,
alien - a foreigner; adverse; hostile; opposed (usually followed by to or from)
invasive - tending to spread
stem – (stemmed) - to arise or originate
amelioration - to improve something, or to make it less severe
resilience - the ability to become strong, healthy, or successful again after something bad happens

PART XI

TESTS

TEST 1

MATCH EACH DEFINITION WITH ITS TERMS:

1. It is the whole plant but also its gums, oils, resins, extracts, etc.
2. It is used for its organoleptic properties
3. They are substances responsible for pharmacological action.
4. Substances, like anthraquinones, which are used to make perfumes, dyes.
5. They are soluble in alcohol and fats, but only slightly soluble in water and they are also called volatile oil.
6. They are made up of active constituents that have a therapeutic effect in organism. In addition, they are recorded in in pharmacopea.
7. They are medicinal plants, whose active constituents contain volatile organic components.
8. They attract to them pollinators, nectar and honey collectors. Most of the time, they are insects such as bees.
9. It is the part of the plant used for therapeutic effect.

a) Medicinal plants
b) Vegetal drug
c) Vegetal material
d) Active constituents
e) Aromatic plants
f) Condiment/ spice
g) Honey plant
h) Tincture plant
i) Essential oil

1	2	3	4	5	6	7	8	9

TEST 2

1) DOCTORS AND PHILOSOPHERS IN CLASSICAL ANTIQUITY. MATCH EACH DOCTOR TO ITS CORRECT DESCRIPTION.

1. Greek physician whose work had a great influence on Western Medicine for more than 1,000 years.

2. Persian physician, scientist and philosopher, which was considered considerado as one of the most important doctor of all the times.
3. Greek physician who believed that illness/ sick had natural causes and threated them with herbal remedies/prescription.
4. His book "De Materia Medica" shows information of more than 600 medicinal plant species.

a) Galen from Pergamon (130 – 200 A. C.)
b) Dioscorides (40 – 90 A. C.)
c) Hippocrates (c. 460 BCc. 380 BC)
d) Avicenna, Abu Ibn Sina (980 – 1037 A. C.)

2) MARK THE TRUE ANSWER

The first record for MAPs. Which was the first medical document?

1. A 4,000-year-old Sumerian clay tablet that recorded plant remedies of popular disease.
2. The plants founded in a Neanderthal excavation.
3. A Chinese pharmacopea, the Pen Tsao, which characterized more than 365 herbs as splendid, average and inferior plant.
4. The Rig – Veda or Hindu holy verse.

TEST 3

1) MARK THE TRUE ANSWER.

1) What have been the most extended criteria for classification of medicinal plants?

1. According to use.
2. According to yield of vegetable oils.
3. According to medicinal or pharmaceutological property.
4. According to active principles.

2) How are actually classified plants?

1. It is used a complete Latinized hierarchy sequence, which go from more to less detail. The sequence is specie, genus, family, order, class and division.
2. It is used two names the first is the genus and the second is the specific epithet (according to specie)
3. All are true.
4. The first letter of the genus must be a capital letter.

3) Valeriana officinalis. Accordingly to its definitions, Valerian (Valeriana officinalis) root is ... .

a) a vegetal drug
b) an aromatic plant
c) a medicinal plant
d) all the answers are correct

4) Aromatic plants are medicinal plants and consequently these last ones are also considered as aromatic.

a) True
b) False

5) Biopolymers link to secondary metabolites which are waste products of plant metabolism.

a) True
b) False

TEST 4

1) MATCH EACH SPECIES TO ITS DRUG

1. Cinchona spp.	a) Quinine bark
2. Chamomila recutita	b) Coca
3. Erythroxylum coca	c) Tobacco
4. Digitalis purpurea	d) Purple foxglove
5. Nicotiana tabacum	e) Opium poppy
6. Papaver somniferum	f) Chamomille

2) MATCH EACH PLANT SPECIES WITH ITS USE

1. Dye plant	a)Lavander (*Lavandula* spp.)
2. Medicinal plant	b) Saffron (*Crocus sativus*)
3. Seasonings	c)Heather or heaths (*Erica* spp.)
4. Honey plant	d) Dyer's wood (*Isatis tinctoria*)
5. Aromatic plant	e)Foxglove (*Digitalis purpurea*)

3) MATCH A MEDICAL USE FOR EACH PLANT SPECIES

1. Heart disease.	a) *Digitalis purpurea*
2. It is supposed to improve virility and the conception.	b) *Valeriana officinalis*
3. Sedative and relaxing for the nervous system.	c) Salix bark (acetylsalicylic acid)
4. Hallucinogenic effects.	d) *Mandragora officinalis*
5. Analgesic and febrifuge.	e) *Claviceps purpurea*

4) MATCH EACH KIND OF PLANT TO A GROUP OF PLANT SPECIES ACCORDING TO THE PERIOD OF LIFE

1. Annual herb	a) Greek alfalfa (Lucerne), catnip and lavender
2. Perennial herbs	b) Prime rose and caraway seeds
3. Biennial herbs	c) Basil and borage

5) MATCH THE BEST DEFINITION.

1. Aromatic herbs
2. Astringent herbs
3. Bitter herbs
4. Mucilaginous Herbs
5. Nutritive Herbs

a) They contain polysaccharides that eliminate toxins from the intestinal system;
b) They have tannins that precipitate protein and help to halt discharge;
c) They are rich in proteins, carbohydrates and fats, with an extra dose of vitamins and minerals;
d) They contain phenols and phenols glycoside, alkaloids.
e) They have a pleasant odour

TEST 5

1) MARK THE WRONG ANSWER.

1. Culinary herbs have strong flavours and in addition Aromatic Herbs could have oils.
2. Rosemary is a culinary and an aromatic herb as well.
3. Aromatic herbs can be used to produce perfumes, scenes and toilet water
4. There is no significant difference between them.

2) MARK THE TRUE ANSWER.

Aromatic Herbs can be divided into Stimulant and Nerving herbs.
What is the difference between them?

1. Stimulant herbs only affect the respiratory, digestive and circulatory systems, while nerving herbs have a particular effect on the nervous system
2. There is neither difference between them
3. Plants can act neither as nerving nor stimulant herbs

4. Nerving herbs increase energy and activity of the body while stimulant herbs sooth the nervous system.

3) MARK THE TRUE ANSWER: WHAT IS A DIURETIC HERB?

1. An herb which induces loss of fluid from the body through the urinary system
2. An herb which helps to reduce weight by eliminating fat.
3. An herb which emulsifies fat soluble molecules in the digestive tract and help to absorb other active compounds
4. An herb which belongs to the Astringent group of herbs

4) MATCH EACH PROCESS WITH ITS DEFINITION.

1. drying
2. pulverisation
3. sieving and straining
4. mixing
5. extraction

a) It helps to obtain particles of specific size, so it is used light-sieves with decreasing mesh sizes;
b) It helps to free the achieved ingredients in the drug by increasing contact surface and breaking down cell structures;
c) It produces several different drugs of MAPs which engance their performance. Excipients may be added.
d) It makes easier the preservation of vegetable matter because it stops the metabolic decomposition process;
e) It is a preparation of a vegetable drug which contains only soluble active ingredients in the medium used.

5) MATCH THE FOLLOWING CONCEPTS TO ITS DEFINITION.

1. raw material
2. active ingredient.
3. excipient
4. traditional physician's form
5. medicament for human use
6. master formula

a) It is added to the active ingredient to facilitate stability;
b) Any matter with the appropriate activity for the preparation of the medicament;
c) They are defined according to the format in which the pharmaceutical product is presented and according to how they are administrated;

d) It is a medicine designed to an individual patient, prepared by a pharmacist specifically to complement the active ingredient of a medical prescription.
e) Substances which have properties for the treatment or prevention of disease in human beings;
f) Any substance used to prepare a medicament.

TEST 6

MATCH A TYPE OF MEDICAL PREPARATION WITH ITS RIGHT DEFINITION.

1) tonic		a) Cloth soaked in a cool infusion or decoction and applied externally
2) elixir		b) Herb dried and chopped
3) oil		c) Herbal bark or root boiled in liquid, usually 10-50 minutes
4) tincture		d) A remedy made of the "drug," alcohol, water, and sugar
5) poultice		e) Herbal flowers, stems, or leaves covered with lightly boiled water and allowed to steep. Steeping for 5-10 minutes produces herbal tea. Some reserve the term infusion for liquids that steep longer and are stronger
6) powder		f) Crushed herbs simmered in melted petroleum jelly for several minutes then cooled; or tincture added to commercial lotion; applied externally
7) crude herbs		g) Herb placed in vegetable oil with a small amount of vinegar and allowed to sit for weeks in a warm place; applied externally Oils may become contaminated by bacterial or fungal growth.
8) tea; infusion		h) Concentrated volatile aromatic oils distilled from herbs. Use of undiluted essentials oils can be dangerous! Essential oils should be diluted first and used only externally. Essential oils should not be used or inhaled by children.
9) essential oils		i) Ground up crude herbs
10) ointment		j) Fresh herbs moistened or boiled briefly and applied externally, often wrapped in muslin or cheesecloth to make them more manageable
11) decoction		k) Herbal extract steeped in alcohol (or warmed cider vinegar or wine vinegar) for two days to six weeks; strongest and longest-lasting preparation, often good for three years
12)compress		l) A remedy that stimulates, refreshes, invigorates, restores

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

TEST 7

1) MARK THE TRUE ANSWER.

Essential oil properties. What is not an essential oil feature?

1. They are volatile and liquid at room temperature.
2. They are colourless and yellow.
3. They are more dense than water.
4. They both have an high optical rotation and refractive index.
5. They are soluble in alcohol and organic solvent.
6. They can dilute in fats and oils.
7. They are soluble in water, so they can be distilled.

2) MARK THE WRONG ANSWER.

Plants which are rich in essential oils belong to the following family.

a) Umbeliferae (aniseed, fennel).
b) Mirtaceae (eucalyptus)
c) Compositae (camomile)
d) Cruciferae (*Brassica* spp., *Sinapis* spp.)
e) Solanaceae (*Solanum* spp., *Nicotiana* spp.)

***3) MARK THE TRUE ANSWER* ACCORDING TO THE ORIGIN OF ESSENTIAL OIL**

a) The lemon essential oil is obtained by cold expression of pericarp is considered as natural
b) A pure essential oil, extracted by ethanol, is considered artifitial.
c) Mint essential oil, which is added menthol, is natural oil.
d) Vanilla essences in foodstuffs are usually synthetic oil.

4) MARK THE BEST DEFINITION FOR CHEMOTYPE.

a) The variation (%) of total essential oil content in a plant.
b) The daily or seasonal variation of essential oil components into the same botanic plant specie.
c) The variation of essential oil component, even though in the same botanic species, as a result of different geographic, genetic and growing conditions.
d) The relative variation of essential oil content due to any different conditions (daily, seasonal, genetic and geografic).

5) MARK THE WRONG ANSWER.

a) A high content of target active constituent is extracted with an essential oil fractionation.
b) De-waxing is especially useful for essential oil of citrus fruit.
c) Removing out terpenoids is useful to eliminate undesirable smell o taste
d) Filtatrion is used to clear up excess of water from distillation process.
e) Rectification consists of an essences fractionation in different proportion of density.

TEST 8

1) MATCH EACH PLANT COMPONENT TO ITS PERFUME OR ESSENTIAL OIL.

1. Camphor	a) seed
2. Ylang – ylang	b) root
3. Citrus fruit	c) Lemon peel
4. Vanilla	d) wood
5. Pine	e) resin
6. Ginger	f) flowers
7. Coriander	g) bark cinnamon
8. Birch	h) fruits

2) MARK THE WRONG ANSWER

Some popular plants used in cosmetic are below mentionned.

a) Soya. A Chinese plant known for over 5,000 years. It is rich in isofalvones.
b) White tea, is not as effective against free radical as green tea.
c) Botanical extracts of Gingko biloba, ginseng, lavender and aloe vera.
d) Camomile is used to make creams for sensitive skins.

3) MARK THE WRONG ANSWER.

What colour do they produce?

1. Curcumin	a) red
2. Ribo-flavin	b) green
3. Chlorophyl	c) yellow
4. Cochinilla carmine	d) yellow-orange

4) MARK THE TRUE ANSWER.

What is the original plant where the following preservatives are obtained?

1. Carvacrol and timol	a) Oregano
2. Carnosic acid	b) Aromatic cloves, laurel and basil
3. Capsaicine	c) Rosemary
4. Curcumin	d) Spicy ajies
5. Eugenol	e) Curcuma

5) MARK THE TRUE ANSWER.

Species origin. Match an origin area to a group of species.

1. Tropical Asian countries	a) Cinnamon, pepper, cloves and nutmeg
2. Central American countries	b) Coriander, fennel, aniseed
3. Mediteranean countries (warm)	c) Dill and juniperus
4. Mediteranean countries (cold)	d) pepper, vanilla and chilli

USEFUL PHRASES FOR ABSTRACTS AND TEXT RENDERING

СТАНДАРТНЫЕ ФРАЗЫ, ОБОРОТЫ, КОНСТРУКЦИИ ДЛЯ РЕФЕРИРОВАНИЯ

1. Название статьи, автор, стиль

- The article, I'm going to give a review of, goes under the heading ….. — Статья, которую я сейчас хочу проанализировать, называется …
- The article to be reviewed is taken from… — Статья, которую необходимо проанализировать, взята из…
- The headline of the article is — Заголовок статьи…
- The author of the article is… — Автор статьи…
- It is written by — Она написана …
- The article under discussion is … — Статья, которую мне сейчас хочется обсудить, …
- The title of the given article is … — Заголовок данной статьи

2. Тема. Логические части

- The topic of the article is… — Тема статьи
- The key issue of the article is… — Ключевым вопросом в статье является
- The article under discussion is devoted to the problem of… - Статью, которую мы обсуждаем, посвящена проблеме…
- The author in the article touches upon the problem of… — В статье автор затрагивает проблему….
- I'd like to make some remarks concerning… — Я бы хотел сделать несколько замечаний по поводу…
- I'd like to mention briefly that… - Хотелось бы кратко отметить…
- I'd like to comment on the problem of… — Я бы хотел прокомментировать проблему…
- The article under discussion may be divided into several logically connected parts which are… — Статья может быть разделена на несколько логически взаимосвязанных частей, таких как…

3. Краткое содержание

- *At the beginning of the article the author* - В начале статьи автор

describes — описывает	introduces – знакомит/ mentions - упоминает
depicts - изображает	recalls -вспоминает
touches upon - затрагивает	makes a few critical remarks on – делает
explains - объясняет	несколько критических замечаний о

- *The article begins (opens) with a (the)* – Статья начинается с …..

description of - описанием statement - заявлением introduction of - представлением the mention of - упоминанием	the analysis of a summary of - кратким анализом/ the characterization of - характеристикой/ (author's) opinion of - мнением автора/ author's recollections of - воспоминанием автора/ the enumeration of - перечнем

- *In conclusion the author* – В заключении автор ……

dwells on - останавливается на	exposes - показывает
points out - указывает на то	accuses/blames -обвиняет
generalizes – обобщает/ reveals - показывает	gives a summary of -дает обзор

4. Отношение автора к отдельным моментам

- The author gives full coverage to… - Автор дает полностью охватывает…
- The author outlines… - Автор описывает
- The article contains the following facts…./ describes in details… - Статья содержит следующие факты …. / подробно описывает
- The author starts with the statement of the problem and then logically passes over to its possible solutions. - Автор начинает с постановки задачи, а затем логически переходит к ее возможным решениям.
- The author asserts that… - Автор утверждает, что …
- The author resorts to … to underline… - Автор прибегает к …, чтобы подчеркнуть …
- Let me give an example… - Позвольте мне привести пример …

5. Вывод автора

- In conclusion the author says / makes it clear that…/ gives a warning that… - В заключение автор говорит / проясняет, что … / дает предупреждение, что...
- At the end of the story the author sums it all up by saying … - В конце рассказа автор подводит итог всего этого, говоря …
- The author concludes by saying that../ draws a conclusion that / comes to the conclusion that - В заключение автор говорит, что .. / делает вывод, что / приходит к выводу, что

6. Ваш вывод

- Taking into consideration the fact that - Принимая во внимание тот факт, что
- The message of the article is that /The main idea of the article is - Основная идея статьи (послание автора)
- In addition… / Furthermore… - Кроме того
- Back to our main topic… - Вернемся к нашей основной теме

- To come back to what I was saying… - Чтобы вернуться к тому, что я говорил
- In conclusion I'd like to… - В заключение я хотел бы …
- From my point of view… - С моей точки зрения …
- As far as I am able to judge… - Насколько я могу судить .
- My own attitude to this article is… — Мое личное отношение к
- I fully agree with/ I don't agree with - Я полностью согласен с/ Я не согласен с
- It is hard to predict the course of events in future, but there is some evidence of the improvement of this situation. - Трудно предсказать ход событий в будущем, но есть некоторые свидетельства улучшения.
- I have found the article dull / important / interesting /of great value - Я нахожу статью скучной / важной/ интересной/ имеющую большое значение (ценность)

GENERAL PHRASES

As to ..., Что касается ...,	To add to it, ... В добавок, ...
Actually, ... Фактически, ...	In addition, ... К тому же, ...
Moreover, ... Более того, ...	In a word,... Одним словом, ...
Besides,... Кроме того, ...	In short, ... Короче, ...
So, to sum it up, ... Итак, подводя итог,	In conclusion, ... В заключение,

- It goes without saying that... - Само собой разумеется, что ...
- It is important to note that ... - Важно отметить, что ...
- It's important to remember that ... - Важно помнить, что ...
- On the one hand, .., on the other hand, .. - С одной стороны .., с другой стороны
- It's well known that ... - Известно, что ...
- So far as we know, ... - Насколько нам известно, ...
- Attention is called to the fact that… - внимание привлекается к тому факту, что

ENGLISH - LATIN– RUSSIAN LIST OF HERBS AND PRODUCTS

alder buckthorn – *Rhamnus frangula* L. – Крушина ольховидная – product: Cortex Frangulae

Alexandrian Senna – *Cassia senna* L. – Сенна александрийская – products: Folium Sennae, Fructus Sennae

Aloe – *Aloe vera* (L.) Burm., *A. ferox* Mill. and its hybrids with *A. africana* Mill. and *A. spicata* Baker – Алоэ – product: Aloe Gel

American ginseng – *Panax quinquefolius* L. – Женьшень пятилистный – product: Radix Panacis Quinquefolii

Anise – *Pimpinella anisum* L. – Анис обыкновенный – products: Aetheroleum Anisi, Fructus Anisi

ansu apricot, Siberian apricot, Tibetan apricot – *Prunus armeniaca* L., *Prunus armeniaca* L. var. *ansu* Maxim. or allied species – Абрикос – product: Semen Armeniacae

ashwagandha, Indian ginseng, poison gooseberry, winter cherry – *Withania somnifera* (L.) Dunal. – Витания – product: Radix Withaniae

Baikal skullcap – *Scutellaria baicalensis* Georgi – Шлемник байкальский – product: Radix Scutellariae

balm, balm mint – *Melissa officinalis* L. – Мелиса лекарственная – product: Folium Melissae

Barberry, European barberry – *Berberis vulgaris* L. – Барбарис обыкновенный – product: Cortex Berberidis

bearberry – *Arctostaphylos uva-ursi* (L.) Spreng. – Толокнянка, или Медвежье ушко – product: Folium Uvae Ursi

bilberry, whortleberry, European blueberry – *Vaccinium myrtillus* L. – Черника – product: Fructus Myrtilli

bishop's flower, bishop’s weed, false bishop’s weed, bullwort, greater ammi, lady’s lace, False Queen Anne's lace, laceflower – *Ammi majus* L. – Амми большая – product: Fructus Ammi Majoris

bisnaga, toothpickweed, khella – *Ammi visnaga* (L.) Lam. – Амми зубная – product: Fructus Ammi Visnagae

bitter melon, bitter gourd, bitter squash – *Momordica charantia* L. – Момордика харанция, или Горький огурец – product: Fructus Momordicae

black cohosh, black bugbane, black snakeroot, fairy candle – *Cimicifuga racemosa* (L.) Nutt. – Клопогон, или Воронец кистевидный – Rhizoma Cimicifugae Racemosae

blackhaw or black haw, blackhaw viburnum, sweet haw, stag bush – *Viburnum prunifolium* L. – Калина – Калина сливолистная – product: Cortex Viburni Prunifolii

bullhead, caltrop, cat's head, devil's eyelashes, devil's thorn, devil's weed, goathead, Puncture Vine, Puncturevine, tackweed – *Tribulus terrestris* L.– Якорцы стелящиеся – product: Fructus Tribuli

cardoon – *Cynara cardunculus* L. – Артишок испанский – product: Folium Cynarae

cardus marianus, milk thistle, blessed milk thistle, Marian Thistle, Mary Thistle, Saint Mary's Thistle, Mediterranean milk thistle, variegated thistle, Scotch thistle – *Silybum marianum* (L.) Gaertn. – Расторопша пятнистая – product: Fructus Silybi Mariae

cascara buckthorn, cascara, bearberry – *Rhamnus purshiana* D.C. – Же(о)стер Пурша – product: Cortex Rhamni Purshianae

castor oil plant – *Ricinus communis* L. – Клещевина обыкновенная – product: Oleum Ricini

cat's claw – *Uncaria tomentosa* (Willd.) DC. – Ункария опушенная – product: Cortex Uncariae

centella, gotu kola, Asiatic pennywort, Indian pennywort – *Centella asiatica* (L.) Urban. – Центелла азиатская – product: Herba Centellae

Chinese ephedr, Joint-pine, Jointfir, Mormon-tea, Brigham Tea – *Ephedra sinica* Stapf, other ephedrine-containing *Ephedra* species – Эфедра – product: Herba Ephedrae

Chinese peony, common garden peony – *Paeonia lactiflora* Pallas – Пион молочноцветковый – product: Radix Paeoniae

Chinese Thoroughwax, Sickle hare's ear and Sickle-leaf hare's ear – *Bupleurum falcatum* L. – Володушка серповидная – product: Radix Bupleuri

Cloves – *Syzygium aromaticum* (L.) Merrill et L.M. Perry – Гвоздичное дерево – Flos Caryophylli

comfrey - *Symphytum officinale* - окопник аптечный

common evening primrose, evening star, sun drop – *Oenothera biennis* L. – Ослинник двулетний – product: Oleum Oenotherae Biennis

common hamamelis, American witch-hazel – *Hamamelis virginiana* L. – Гамамелис виргинский – product: Folium et Cortex Hamamelidis

common hop or hop – *Humulus lupulus* L. – Хмель обыкновенный – product: Strobilus Lupuli

Cork-tree – *Phellodendron amurense* Rupr., *P. chinense* Schneid. – Бархат амурский и китайский – product: Cortex Phellodendron

dandelion – *Taraxacum officinale* Weber ex Wiggers – Одуванчик лекарственный – product: Radix cum Herba Taraxaci

Desert Indianwheat, Blond Psyllium – *Plantago ovata* Forsk. – Подорожник яйцевидный – product: Testa Plantaginis

dill – *Anethum graveolens* L. – Укроп душистый – product: Fructus Anethi

eastern purple coneflower or purple coneflower – *Echinacea purpurea* (L.) Moench – Эхинацея пурпурная – product: Herba Echinaceae Purpureae

elder, elderberry, black elder, European elder, European elderberry, European black elderberry – *Sambucus nigra* L. – Бузина черная – product: Flos Sambuci

female ginseng – *Angelica sinensis* (Oliv.) Diels – Дудник китайский – product: Radix Angelicae Sinensis

Fennel – *Foeniculum vulgare* Mill. – Фенхель обыкновенный – Fructus Foeniculi

Fenugreek – *Trigonella foenum-graecum* L. – Пажитник греческий – product: Semen Trigonellae Foenugraeci

feverfew – *Tanacetum parthenium* (L.) Schultz Bip. – Пиретрум (Пижма) девечий – product: Herba Tanaceti Parthenii

five flavor berry – *Schisandra chinensis* (Turcz.) Baill. – Лимонник китайский – product: Fructus Schisandrae

Gambier, Cat's Claw – *Uncaria rhynchophylla* (Miq.) Jacks, *U. macrophylla* Wall., *U. hirsuta* Havil., *U. sinensis* (Oliv.) Havil., *U. sessilifructus* Roxb. – Ункария – product: Ramulus cum Uncis Uncariae

garlic – *Allium sativum* L. – Лук посевной, или Чеснок – product: Bulbus Allii Sativi

Ginger – *Zingiber officinale* Roscoe – Имбирь – product: Rhizoma Zingiberis

gingko, maidenhair tree – *Ginkgo biloba* L. – Гингко двулопастный – product: Folium Ginkgo

Ginseng – *Panax ginseng* C.A. Meyer – Женьшень – product: Radix Ginseng

Goldthread, Canker Root – *Coptis chinensis* Franch, *Coptis deltoides* C.Y. Cheng et Hsiao, *Coptis japonica* Makino (Ranunculaceae), other berberine-containing species of the same genus – Коптис – product: Rhizoma Coptidis

grapple plant, wood spider and devil's cla – *Harpagophytum procumbens* DC. ex Meiss. – Герпагофитум – product: Radix Harpagophyti

great yellow gentian – *Gentiana lutea* L. – Горечавка желтая – Radix Gentianae Luteae

green cardamom, true cardamom – *Elettaria cardamomum* (L.) Maton – Кардамон – product: Semen Cardamomi

Green chirayta, creat, king of bitters, andrographis, India echinacea – *Andrographis paniculata* (Burm. f.) Nees – Андрографис – product: Herba Andrographidis

gum tree – *Eucalyptus globulus* Labill, other *Eucalyptus* species rich in 1,8-cineole – Эвкалипт шариковый и другие виды богатые цинеолом – product: Aetheroleum Eucalypti

hawthorn, thornapple, May-tree, whitethorn, hawberry – *Crataegus monogyna* Jacq. (Lindm), *C. laevigata* (Poir.) DC, their hybrids or, more rarely, other *Crataegus* species – Боярышник – products: Folium cum Flore Crataegi

holy basil – *Ocimum sanctum* L. – Базилик священный – product: Folium Ocimi Sancti

horse-chestnut, conker tree – *Aesculus hippocastanum* L. – Конский каштан обыкновенный – product: Semen Hippocastani

Houpu Magnolia, Magnolia-bark – *Magnolia officinalis* Rehder and Wilson, *M. officinalis* Rehder and Wilson var. *biloba* Rehder and Wilson, *M. obovata* Thunberg. – Магнолия лекарственная и обратнояйцевидная – product: Cortex Magnoliae

Iceland moss – *Cetraria islandica* (L.) Acharius s.l. – Цетрария исландская – product: Lichen Islandicus

Indian bdellium-tree, gugal, guggul, gugul, Mukul myrrh tree – *Commiphora mukul* (Hook. ex Stocks) Engl. – Гуггул – product: Gummi Gugguli

Indian snakeroot, sarpagandha – *Rauvolfia serpentina* (L.) Benth. ex Kurz – Раувольфия змеиная – product: Radix Rauwolfiae

ipecacuanha – *Cephaelis ipecacuanha* (Brot.) A. Rich., *C. acuminata* (Benth.) Karst. – Ипекакуана, или Рвотный корень – product: Radix Ipecacuanhae

Japanese gentian – *Gentiana scabra* Bunge – Горечавка шероховатая – product: Radix Gentianae Scabrae

Java brucea – *Brucea javanica* (L.) Merr. – Бруцея яванская – product: Fructus Bruceae

jujube, red date, Chinese date, Korean date, Indian date – *Zizyphus jujuba* Mill., *Z. jujuba* var. *inermis* Rehd. – Зизифус настоящий, Унаби, или Китайский финик – product: Fructus Zizyphi

Kava, kava-kava – *Piper methysticum* G. Forst. – Перец опьяняющий – product: Rhizoma Piperis Methystici

Korean bellflower, Chinese bellflower, Japanese bellflower, common balloon flower, balloon flower – *Platycodon grandiflorum* (Jacq.) A. DC. – Широколокольчик крупноцветковый – product: Radix Platycodi

Kutki – *Picrorhiza kurrooa* Royle or *Neopicrorhiza scrophulariiflora* Hong [*Picrorhiza scrophulariiflora* Pennell] – Пикрориза – product: Rhizoma Picrorhizae

large cranberry, American cranberry, bearberry – *Vaccinium macrocarpon* Ait. – Клюква крупноплодная, или американская – product: Fructus Macrocarponii

lavender – *Lavandula angustifolia* Mill., *L. intermedia* Loisel – Лаванда узколистная и гибридная, или голландская – product: Aetheroleum Lavandulae

lavender, English lavender, common lavender, true lavender, narrow-leaved lavender – *Lavandula angustifolia* Mill. – Лаванда узколистная – product: Flos Lavandulae

leopard's bane, wolf's bane, mountain tobacco and mountain arnica – *Arnica montana* L. – Арника горная – product: Flos Arnicae

Liquorice, licorice – *Glycyrrhiza glabra* L. – Солодка голая – product: Radix Glycyrrhizae

Makino – *Rehmannia glutinosa* Libosch., *Rehmannia glutinosa* Libosch. var. *purpurea* – Ремания клейкая – product: Radix Rehmanniae

marshmallow, marsh mallow, common marshmallow – *Althaea officinalis* L. – Алтей лекарственный – product: Radix Althaeae

maypop, purple passionflower, true passionflower, wild apricot, and wild passion vine – *Passiflora incarnata* L. – Страстоцвет мясо-красный – product: Herba Passiflorae

membranous milkvetch and **Mongolian milkvetch** – *Astragalus membranaceus* (Fisch.) Bunge, *A. mongholicus* Bunge – Астрагал перепончатый и монгольский – product: Radix Astragali

myrrh – *Commiphora molmol* Engler and other related *Commiphora* species, including *C. abyssinica* Engl., *C. erythraea* and *C. schimperi* Engl., but excluding *C. mukul* – Коммифора, Мирра – product: Gummi Myrrha

Narrow-leaved Paperbark, Narrow-leaved Tea-tree, Narrow-leaved Ti-tree, Snow-in-summer – *Melaleuca alternifolia* (Maiden and Betche) Cheel – Мелалеука, или Чайное дерево – product: Aetheroleum Melaleucae Alternifoliae

Narrow-leaved purple coneflower, blacksamson echinacea, pale purple coneflower – *Echinacea angustifolia* D.C. var. *angustifolia*, its variety *strigosa* McGregor, *E. pallida* (Nutt.) Nutt. – Эхинацея узколистная и бледная – product: Radix Echinaceae

Neem, Nimtree, Indian Lilac – *Azadirachta indica* A. Juss. – Азадирахта индийская, или Ним – products: Folium Azadirachti, Oleum Azadirachti

nettles, stinging nettles – *Urtica dioica* L., *U. urens* L. – Крапива двудомная, к. жгучая – product: Radix Urticae

onion – *Allium cepa* L. –Лук репчатый – product: Bulbus Allii Cepae

orangeroot or yellow puccoon – *Hydrastis canadensis* L. – Желтокорень канадский – product: Rhizoma Hydrastis

peppermint – *Mentha piperita* L. – Мята перечная – products: Aetheroleum Menthae Piperitae, Folium Menthae Piperitae

pomegranate – *Punica granatum* L. – Гранат обыкновенный – products: Cortex Granati, Pericarpium Granati

pot marigold, ruddles, common marigold, garden marigold, English marigold, Scottish marigold – *Calendula officinalis* L. – Календула лекарственная, или Ноготки лекарственные – product: Flos Calendulae

Psidium guajava L. – **common guava** – Гуайява – product: Folium Guavae

Psyllium – *Plantago afra* L., *P. indica* L., *P. ovata* Forsk., *P. asiatica* L. – Псилиум, или Блошиный подорожник – Semen Plantaginis

red clover – *Trifolium pratense* L. – Клевер луговой – product: Flos Trifolii

red stinkwood – *Prunus africana* (Hook. f.) Kalkman – Слива африканская – product: Cortex Pruni Africanae

rhubarb – *Rheum officinale* Baill., *R. palmatum* L. – Ревень лекарственный и пальчатый – product: Rhizoma Rhei

rosemary – *Rosmarinus officinalis* L. – Розмарин лекарственный – product: Aetheroleum Rosmarini, Folium Rosmarini

Safflower – C*Carthamus tinctorius* L. – афлор красильный – product: Flos Carthami

saffron crocus – *Crocus sativus* L. – Крокус посевной, или Шафран – Stigma Croci

Salai – *Boswellia serrata* Roxb. ex Colebr. – Босвеллия пильчатая – product: Gummi Boswellii

saw palmetto – *Serenoa repens* (Bartr.) Small. – Сереноя ползучая – product: Fructus Serenoae Repentis

Seneca snakeroot, senega snakeroot, senegaroot, rattlesnake root, and mountain flax – *Polygala senega* L., *Polygala senega* L. var. *latifolia* Torrey et Gray, or other closely related *Polygala* species – Истод сенега – product: Radix Senegae

Siberian Ginseng, eleuthero – *Eleutherococcus senticosus* (Rupr. and Maxim.) Maxim. – Элеутерококк колючий – product: Radix Eleutherococci

St John's wort – *Hypericum perforatum* L. – Зверобой продырявленный – product: Herba Hyperici

Tasmanian Blue Gum, Southern Blue Gum or Blue Gum – *Eucalyptus globulus* Labill – Эвкалипт шариковый – product: Folium Eucalypti

thyme – *Thymus vulgaris* L., *T. zygis* L. – Тимьян, или Чабрец – product: Herba Thymi

true cinnamon, Ceylon cinnamon, Sri Lanka cinnamon – *Cinnamomum verum* J.S. Presl. – Коричник настоящий – product: Cortex Cinnamomi

tumeric – *Curcuma wenyujin* Y.H. Lee et C. Ling, *C. kwangsiensis* S. Lee et C.F. Liang., *C. phaeocaulis* Val. – Куркума – product: Rhizoma Curcumae Longae

Valerian – *Valeriana officinalis* L. – Валериана лекарственная – Radix Valerianae

Vitex, Chaste Tree, Chasteberry, Abraham's Balm or Monk's Pepper – *Vitex agnus-castus* L. – Витекс священный, или Авраамово дерево – product: Fructus Agni Casti

wild chamomile, scented mayweed – *Chamomilla recutita* (L.) Rauschert – Ромашка аптечная – product: Flos Chamomillae

Willow, sallow, osier – *Salix alba* L., *S. daphnoides* Vill., *S. fragilis* L., *S. purpurea* L., and other appropriate *Salix* species – Ива – product: Cortex Salicis

winter squash, pumpkin, summer squash – *Cucurbita pepo* L. – Тыква обыкновенная – product: Semen Cucurbitae

yarrow, common yarrow – *Achillea millefolium* L. – Тысячелистник обыкновенный – product: Herba Millefolii

Yellow Myrobalan or Chebulic Myrobalan – *Terminalia chebula* Retz. or *T. chebula* Retz. var. *tomentella* Kurt. – Терминалия – product: Fructus Chebulae

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