

Herbs

I. Introduction to Herbs

A. Medical Use of Herbs

1. Greek and Roman Medicine
 - a. Aristotle (Garden of Herbs)
 - b. Theophrastus, wrote about the use of herbs
 - c. Dioscorides, wrote an herbal
 - d. Claudius Galen, a roman doctor that used herbs
 - e. Charlemagne, encouraged gardens
2. Elizabethan Herbalists - 16th & 17th centuries
 - a. John Gerard - 1597. **General Historie of Plants**. He wrote about plants based on his garden works at Queen Elizabeth's and Lord Burleigh estates and as an apothecary for James I.
 - b. James Parkinson - 1640. **Theatrum Botanicum**. He wrote this book as an apothecary to James I.
 - c. Nicholas Culpeper - 1649-1653. **Complete Herbal**. He wrote about herbs, folklore, superstition and astrology.

B. Other Studies of Herbs and their Uses

1. Doctrine of Signatures (Nomenclature of Herbal Function)
 - a. Each plant was often named and used to cure ailments of the body or a disease whose appearance it most resembled.
 - b. Lung diseases were treated with lung-shaped leaves of Lungwort.
 - c. Hollow stalks of garlic were used for windpipe ailments.
 - d. Colds and flu were treated with dandelion, plantain, yarrow and nettles.

C. Early Medical Use of Trial and Error

1. Discovery of inorganic chemicals as a cure to diseases.
 - a. Paracelsus - 17th century. Used mercury, sulfur, iron and copper sulfate to cure diseases.
2. Samuel Hahnemann used homeopathic practices to cure diseases.
 - a. Symptoms such as fever and boils are methods used by the body to eliminate a disease.
 - b. A small dose of herbal extract is applied to the body to create a symptom like those of the ailment.
 - c. Eliminate disease by helping the body's natural healing process.

3. Using the Body's Checks and Balances
 - a. The body is capable of healing itself once proper conditions are restored.
 - b. General diet and remedy designed to neutralize or eliminate substances from the body.

II. Herbs in North America

A. North American Indian Use of Herbs

1. Indians have a long tradition of herbal use because of tradition and for medical purposes. Most if not all herb usage has strong ties to rituals with deep feelings of superstition.

B. Samuel Thompson (1822 - started the process of patented medical formulas using herbs and other materials.)

C. Shakers, the Church of United Society of Believers, produced and sold herbs from 1820 to 1950 providing funds to support their church.

III. Herbs in the Orient

A. Oriental system of disease diagnosis and herbs is based on cycle of polarity (yin and yang): sun, moon, wet, dry, male, and female. The cooling and heating properties of herbs form a basis of classification.

1. Diseases characterized by coldness (weak digestion and poor circulation) were treated by deep-rooted herbs, barks, affecting internal organs: ginseng, dandelion, prickly ash, bayberry bark, and burdock.
2. Individuals with hot diseases such as fever are treated with cooling detoxifying medicine such as fruit and petals like hibiscus, yarrow, red clover and mint.

B. Oldest written herbal text, 3737-2697 B. C. **Pen-Tsao**, for Emperor Shen-nung was written over 1000 years before **Ebers Papyrus** in Egypt.

C. Yellow Emperor's Classic of Internal Medicine, 2697-2595 B.C., is a comprehensive botanical review of the medical arts in China.

D. **Materia Medica** of Li-Shih-Chen in the 16th century was used in Europe as a source for medical use and cure of diseases.

IV. Classification and Production of Herbs

A. Types of Classifications

1. Tender annuals - basil, borage, and nasturtium
2. Hardy annuals - chamomile
3. Biennials - sage, angelica, and mullein
4. Tender perennials - rosemary and curry
5. Hardy perennials - lavender, hyssop, and chives

B. Growing Requirements

1. Climatic conditions - what is the origin and natural environment of herb?
2. Soil requirements - tolerant to most soil, prefers good drainage. Many herbs are from Mediterranean area where soils are nutrient poor. Examples include alfalfa, fennel, root parsley, lovage, angelica, false indigo, and horseradish.

C. Harvesting Herbs

1. Those before flowering
 - a. Because leaves contain more oils and alkaloids before flowers develop, harvest leaves and stems before flower bloom. Nasturtiums have high amounts of vitamin C before flowering.
2. Those during blooming
 - a. Cut stems and flowers when mature. Lavender, rosemary, thyme, hyssop are good examples.
3. Those after bloom when seed heads turn brown
 - a. Use seeds and stems for seasonings. Examples are anise, caraway, coriander, and dill.
4. Those that produce berries and fruit.
5. Those that produce bark and twigs
 - a. Collect in spring when sap rises and leaves appear.

- D. Storing Herbs
1. Low or no sunlight
 2. Airtight containers, sealed bags or boxes
 3. Store leaves whole
 4. Freezing
 - a. Chop or whole leave
 - b. Plant types: chives, sorrel, parsley, dill, oregano, sweet marjoram, lovage, tarragon, and mint.
- IV. Plant Families Typically Used As Herbs
- A. Flowering Plants
1. Fabaceae (Mint family): Peppermint, spearmint, pennyroyal, basil, lavender, sage, rosemary and thyme.
 2. Asteraceae (Sunflower family): Artemisia (mugwort, wormwood, tarragon), tansy, calendula, chicory, and santolina.
 3. Apiaceae (Parsely family): caraway, dill, coriander, fennel, lovage, parsley, angelica, and chervil.
 4. Boraginaceae (Borage family): Comfrey
 5. Brassicaceae (Mustard family): Black mustard
 6. Liliaceae: (Lily family) Garlic, chives, and Egyptian onion.
- V. Applied Herbal Medicine
- A. Herbal Stimulants and Tonics: sassafras, ginseng, fo ti, garlic, cayenne, black pepper, yarrow, kola nut, gotu kola, yohimbe and tea.
 - B. Soothing Herbs: Chamomile, valerian root, myrrh, licorice, hops, and kava.
 - C. Culinary Herbs: Cinnamon, ginger, thyme, oregano, parsley, basil, alfalfa, dill, rosemary, and sage.
 - D. Psychoactive Herbs: coffee, guarana, cola, damiana, yohimbe, datura, tea, chocolate, wormwood, kava kava, and hops.
- VI. Pharmacology of Herbs
- A. The Chemical Constituents of Herbs
1. How pharmaceutical drugs are made from crude botanical sources: alkaloids, glycosides, essential oils, saponins, mucilages, and tannins.
 2. Alkaloids are very toxic.

A. Three Functions of Herbs

1. Elimination and detoxify (laxatives)
 - a. Diuretic (urine flow and fluid balance)
 - b. Diaphoretic (sweating)
 - c. Blood purifiers (balance acidity): sassafras and Oregon grape root.
2. Maintaining body balance to counteract physical symptoms allowing body to heal itself.
3. Building and toning body organs.

Medicinal Plants

I. History of Medicinal Plants

A. Middle East

- a. 4,000 year old Sumerian clay tablet shows detailed records of plant remedies for various illnesses.
- b. Egyptians prescribed mandrake for pain relief, and garlic for the treatment of heart and circulatory disorders.
- c. Hundreds of remedies are explained in the 3,500 year old Eber papyrus.
- d. In the eleventh century, Avicenna wrote the Canon of Medicine, which contained new information on herbal medicine.

B. Asia

- a. The Pun-tsaio, a pharmacopoeia published around 1600, contained thousands of herbal cures that are attributed to the works of Shen-nung.
- b. The Rig-Veda is a collection of Hindu sacred verses on herbal cures. This led to a system of health care known as Ayurvedic medicine. One useful plant from this body of knowledge is snakeroot, *Rauwolfia serpentina*.

C. Early Greeks and Romans

- a. Herbal medicine of ancient Greece that the foundations of Western medicine were established.
- b. The Greek physician Hippocrates (460-388 BC) believed that disease had natural causes and used various herbal remedies in his treatments.

- c. Dioscorides (1st century AD) was a Roman military physician whose travels with the army brought him in contact with many useful plants. He wrote a book called *De Materia Medica*, which contained an account of over 600 species of plants with medicinal value.
- d. Greek and Roman women used Silphium as an effective contraceptive, but caused its extinction by the end of the fourth century.

II. Age of Herbals

A. Italian Renaissance

- a. During the Italian Renaissance in the early fifteenth century herb usage was renewed. When the printing press was invented in 1440, many new books on herbalism quickly appeared and help start the Age of Herbals.

B. German fathers of Botany

- a. Otto Brunfels, Jerome Bock, Leonhart Fuchs, and Valerius Cordus wrote illustrated books during the sixteenth century.

C. English Herbalist

- a. John Parkinson published *The Herball or Generall Historie* of Plantes in 1597 and later the *Theatrum Botanicum*.
- b. Nicholas Culpepper wrote *The Complete Herbal* using misinformation and superstition for other books

III. Doctrine of Signatures

A. Middle Age Herbals

- a. Books that contained illustrated descriptions of plants and their use.
- b. Paracelsus believed that the medicinal use of plants could easily be ascertained by recognizing distinct "signatures" visible on the plant that correspond to human anatomy.
- c. The red juice of bloodwort should be used to treat blood disorders, and the lobed appearance of liverworts suggests their used in treating liver complaints.

- d. The belief behind the Doctrine of Signatures has been developed independently among many different cultures.

IV. Modern Medicine

A. Scientific Method

- a. During the eighteenth century a dichotomy in medicine developed between practitioners of herbal medicine and regular physicians.
- b. During this same period, herbalism and scientific botany split.

V. Modern Prescription Drugs

A. Foxglove (*Digitalis purpurea*)

- a. William Withering was the first in the medical field to scientifically investigate a folk remedy. He studied the effects of foxglove as a treatment for dropsy (congestive heart disease).

B. Poppy (*Papaver somniferum*)

- a. Friedrich Serturmer isolated morphine from the opium poppy in 1806. Justus von Liebig continued isolating chemical from plants and became a leader in pioneering the field of pharmacology.

C. Willows (*Salix* spp.)

- a. In 1839, salicylic acid was isolated and identified as the active ingredient in a number of plants known for their pain-relieving qualities and was first synthesized in 1853.

D. Prescription Drugs

- a. About 25% of prescription drugs contain plant-derived active ingredients.

VI. Herbal Medicine Today

A. About 80% of the rural population still relies on herbal medicine.

- a. China is leading country in incorporating traditional herbal medicine into a modern health care system.
- b. Plantations exist for the cultivation of medicinal plants and the training of doctors.
- c. Chinese apothecaries contain plant specimens, and prescriptions are measured amounts of specific herbs
- d. India traditional practices have remained quite separate from Western medicine. University students are trained in Western

medicine, but much of the populace puts its belief in the traditional systems.

- e. Ayurvedic medicine, which has a Hindu origin, Unani medicine with its Muslim and Greek roots is another widely practiced herbal tradition.

VII. Active Principles in Plants

A. Secondary Plants Products

- a. Not required for the plant's survival.
- b. Discourage herbivores.
- c. Inhibit bacterial or fungal pathogens.

B. Alkaloids

- a. Over 3,000 alkaloids have been identified. Most of them are from Dicot or fungi.
 - b. Three higher plant families produce alkaloids: Fabaceae, Solanaceae, and Rubiaceae.
 - c. Alkaloids contain nitrogen, typically alkaline and have a bitter taste.
 - d. Affect the nervous system.
- a. Alkaloids are either medicinally important or are hallucinogens or poisons.

C. Glycosides

- a. A sugar molecule is attached to the active component.
- b. Cyanogenic glycosides, cardioactive glycosides and saponins.

D. Cyanogenic glycosides

- a. Release cyanide (HCN) upon breakdown.
- b. Cassava, apples, pears, almonds, apricots, cherries, peaches, and plum contain amygdalins, an abundant glycoside.
- c. A glycoside, $C_{20}H_{27}NO_{11}$, commonly found in seeds and other plant parts of many members of the rose family, such as kernels of the apricot, peach, and bitter almond, which breaks down into hydrocyanic acid, benzaldehyde, and glucose. [From Late Latin *amygdalus*, almond tree, from Greek amygdalos]
- d. **Laetrile**, name given the chemical **amygdalin**, found in the kernels of many fruits, notably apricots, bitter almonds, and peaches. The subject of controversy for many years, laetrile has been purported by some to be a cure for cancer. In 1981 the U.S. National Cancer Institute reported laetrile to be ineffective against

cancer. Theoretically, laetrile releases HCN only in the presence of tumor cells and thus selectively destroys them. This has not been substantiated; therefore, laetrile has not been approved for cancer therapy in the United States.

- e. Both cardioactive glycosides and saponins contain a steroid molecule as the active component. Cardioactive glycosides effect the contraction of the heart. Digitalis is the best known one. Some of the most toxic plants, such as milkweed and oleander, contain toxic levels of cardioactive glycosides.
- f. Saponins cause severe gastric irritation and hemolytic anemia. One useful saponin is diogenin from yams, which can be used as a precursor for the synthesis of various hormones such as progesterone and cortisone.

A steroid hormone, $C_{21}H_{30}O_2$, secreted by the corpus luteum of the ovary and by the placenta, that acts to prepare the uterus for implantation of the fertilized ovum, to maintain pregnancy, and to promote development of the mammary glands.

E. Aspirin

- a. 80 million aspirin are consumed daily.
- b. Bark of willow has long been used to relieve pain and reduce fever.
- c. Ancient Greeks used an infusion of bark from white willow (*Salix alba*) to treat gout, rheumatism, pain and fever. Many Native American tribes had independently discovered the healing powers of willow bark.
- d. Synthetic aspirin began in England in the eighteenth century. Reverend Edmund Stone experimented with willow bark tea for six years and found it beneficial for the treatment of fever and chills.
- e. In the nineteenth century, French and German chemists sought to isolate the active compound from willow bark. In 1828, salicin was first isolated and, over the next decade, the extraction method was defined.
- f. In 1828, salicin was first isolated and the extraction method was refined. Salicylates occur widely in species of Willow, meadowsweet (*Spirea ulmaria*), and wintergreen.
- g. In 1898, Felix Hoffman, a chemist at Bayer Company, came across acetylsalicylic acid in the chemical literature. It was given the name aspirin. The "a" is from the acetylsalicylic acid and the "spirin" from *Spirea*, the plant from which salicylic acid was first

isolated. The names "salicin" and "Salicylic acid" reflect the Salix origin.

Scientific Names	Common Name	Active Principle	Medicinal Use
Aloe vera	Burn Plant	Aloin	Skin Injuries and laxatives
Atropa belladonna	Bellodonna	Atropine	Relaxing muscles, asthma, dilating pupils
Cannabis sativa	Marijuana	Tetrahydrocannabinol	Glaucoma, antinausea
Catharanthus roseus	Madagascar periwinkle	Vinblastine; vincristine	Leukemia and lymphoma
Cephaelis ipecacuantha	Ipecac (ip'i-kak')	Cephaeline emetine	Emetic for poisoning
Chondrodendron tomentosum	Pareira	Tubocurarine	Muscle relaxant during surgery, cerebral palsy, and tetanus
Cinchona spp.	Feverbark tree	Quinine	Malaria
Colchicum autumnale	Autumn crocus	Colchicine	Gout
Digitalis purpurea	Purple foxglove	Digitoxin	Congestive heart failure
Dioscorea spp.	Yam	Diosgenin	Steroid drugs for contraception and inflammation
Ephedra spp.	Ephedra	Ephedrine	Bronchial asthma; bronchitis
Erythoxylon coca	Coca	Cocaine	Local anesthetic for eye surgery
Eucalyptus globulus	Eucalyptus	Eucalyptol	Cough suppressant
Hydnocarpus spp.	Chaulmoogra	Hydnocarpic acid	Leprosy
Papaver somniferum	Opium poppy	Morphine; codeine	Severe pain; cough suppression
Pilocarpus pennatifolius	Jaborandi	Pilocarpine	Glaucoma
Podophyllum peltatum	Mayapple	Podophylin; podophyllotoxin	Warts; cancer
Rauwolfia serpentina	Snakeroot	Reserpine	Hypertension
Salix alba	White Willow	Salicin	Pain; fever; inflammation
Taxus brevifolia	Pacific Yew	Taxol	Ovarian and breast cancer
Sanquinaria canadensis	Bloodroot	Sanquinarine	Anti plague mouthwash

F. Properties of Aspirin

- a. Antinflammatory
- b. Antipyretic (fever-reducing)
- c. Analgesic (fever-relieving)
- d. Prophylactic action (blood-thinner)
- e. John R. Vane (1970) found that low doses of aspirin suppress the aggregation of blood platelets.
- f. Aspirin suppresses prostaglandins, a group of hormones that are widely produced throughout the body and have a number of regulatory functions.

- g. Prostaglandins are not stored in the body, but are released from injured cells or cells that have been stimulated by other hormones.

G. Fever Bark Tree and Malaria

- a. Greeks noted the higher incidence of malaria near swamps or marches. The Italians believed that breathing bad air (mal aria) near swamps caused the disease.
- b. An English physician Sir Ronald Ross discovered the role of mosquitoes transmitting malaria.
- c. The French physician Alphonse Laveran first observed a protozoan (*Plasmodium* spp.) in human blood in 1881.
- d. ***Plasmodium falciparum*** is the species most often responsible for fatalities. Untreated, it can result in cerebral malaria, which is characterized by convulsions, seizures, and coma, and can lead to death.
- e. Not until the application of the fever bark tree, there was no effective treatment for malaria. Incas understood the healing powers of the tree and shared this knowledge with the Jesuit missionaries. In 1638, Countess of Cinchon, wife of the Viceroy of Peru, was treated for and cured of malaria. Word spread quickly, and the bark was introduced into Europe.
- f. In 1820, two French scientists isolated the alkaloid quinine from the bark; within a few years the purified alkaloid was available commercially and replaced whole bark preparations.
- g. During the nineteenth century, the British and Dutch established plantations in India and Java. High-yielding strains of *Cinchona ledgeriana*, whose bark contains 13% quinine, were first developed in Bolivia.
- h. Quinine acts on the merozoite stage, killing the parasite in the bloodstream. It is effective as a prophylactic, preventing the initial infection of red blood. The British colonists made the quinine water more palatable by adding gin; this popularized "gin and tonic" as a favorite drink in the tropics.

H. Snakeroot, Schizophrenia and Hypertension

- a. Long ago Snakeroot, *Rauwolfia serpentina*, was used by healers to cure snake bites.
- b. In 1952, the alkaloid reserpine was the first principle isolated from the roots. Later rescinnamine and deserpidine were isolated.
- c. Reserpine is used as a sedative for schizophrenia and high blood pressure (hypertension).
- d. Reserpine acts on the nervous system by blocking neurotransmitters; this results in the dilation, or relaxation, of the blood vessels.

I. The Burn Plant

- a. Aloe vera sap is used for minor burns and cuts.
- b. The sap contains several anthraquinone glycosides (aloin) and chrysophanic acid (skin healing).
- c. Used as a powerful purgative for the relief of constipation.

J. Cancer Therapy

- a. Active compounds from several plants have become standard treatments for various forms of cancer.
- b. Madagascar periwinkle (*Catharanthus roseus*) produces alkaloids vinblastine and vincristine, which are effective in the treatment of certain forms of leukemia.
- c. Taxol from the Pacific Yew (*Taxus brevifolia*) has proven useful in the treatment of ovarian and breast cancer.