

Economic & Medicinal Botany

Introduction: History of Plant Use in Medicine

Dr. Vinod D. Devarkar

Head Department of Botany Shri Chhatrapati Shivaji College, Omerga



- No one knows where or when plants first began to be used to treat disease
- Accidental discovery of some new plant food that eased pain might have been the beginning of folk knowledge
- Early evidence: the grave of a Neanderthal man buried 60,000 years ago. Pollen analysis indicated that plants buried with the corpse were all of medicinal value

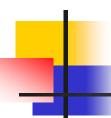


Recorded history

- Earliest record 4,000 year old Sumerian clay tablet recorded numerous plant remedies
- Ancient Egyptian civilization left a wealth of information on medicinal plants and medical practice

Ancient Egypt

- Wealth of knowledge in medicine
- Physicians highly respected and very specialized
- Several important medical papyri
 - Ebers Papyrus
 - Edwin Smith Papyrus
 - Hearst Papyrus
 - Kahun Gynecological Papyrus



Edwin Smith Papyrus

- Purchased by Edwin Smith in Luxor, Egypt in 1862
- Written around 1700 BC but most of the information is based on older records from around 2640 BC -Imhoteps time
 - Imhoteps was physician of 3rd Dynasty
- The papyrus mainly covers wounds, and how to treat them



Ebers Papyrus

- From 1550 B.C. one of the oldest
- Most important and complete medical papyrus recovered
- Hieratic script (similar to hieroglyphics)
- 20.23 m in length and 30 cm. in height
- 110 pages scroll contains 700 magical formulas and folk remedies

河面-13二四三日至北京四月三日本 「AFT 30 字 30 m 2 3 m 2 13 m IMSK4.Zm 四部江州东西公司上283年前是260 1122613Hはた 422名かる 9276 本 帝国和 HATEL HEREN Signal Signal 北北北 TOH'T TOTAL MOS SHE SENSITION AS THE STATE OF THE 知二十 a du 2338.91 Utta 298



Ebers Papyrus

- Purchased in Luxor in 1862 by Edwin Smith
- Said to have been found between the legs of a mummy on the west bank
- Possibly came from tomb of a doctor
- Purchased by Georg Ebers in 1873
- Now in Germany at University Library of Leipzig



- Contains chapters on
 - intestinal disease
 - ophthalmology
 - dermatology
 - gynecology, obstetrics, pregnancy diagnosis, contraception
 - dentistry
 - surgical treatment of abscesses, tumors, fractures and burns

Ebers Papyrus

- Also includes:
 - Description of the circulatory system
 - existence of blood vessels throughout the body
 - heart's function as a center of the blood supply
 - References to diabetes mellitus, hookworm and filariasis, arthritis
 - Section on psychiatry describes a condition of severe despondency

Ancient China

- The Pun-tsao, a pharmacopoeia published around 1600
- Contained thousands of herbal cures that are attributed to the works of Shen-nung, China's legendary Emperor who lived 4500 years ago
- Emperor Shen-nung investigated the medicinal value of several hundred herbs
- Knowledge passed on orally for centuries
- Use of Ephedra for asthma one of these



- Herbal medicine dates back several thousand years to the Rig-Veda, the collection of Hindu sacred verses
- This is the basis of a health care system known as Ayurvedic medicine
- One useful plant that has come from Ayurvedic tradition is snakeroot, Rauwolfia serpentina



- These ancient records indicate that in all parts of the world native peoples discovered and developed medicinal uses of local plants
- Herbal medicine of ancient Greece laid the foundations of our Western medicine



Ancient Greek and Roman medicine

- Greek physician Hippocrates (460-377 B.C.), the Father of Medicine used various herbal remedies in his treatments
- Theophrastus Father of Botany
- Roman physician Dioscorides (1st century A.D.) wrote *De Materia Medica* which contained an account of over 600 species of plants with medicinal value
- Roman physician Galen (2nd century)



De Materia Medica

- Pharmacopoeia which was universally used in the Greek, Roman and Arab worlds from the 2nd century till 16th
- In De Materia Medica, Dioscorides listed 600 plants,
 90 minerals and 30 animal products, with a drawing of each one and a note of its therapeutic properties

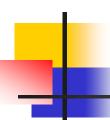
Illustrations from De Materia Medica





De Materia Medica

- Descriptions of plants, directions on the preparation, uses, and side effects
- Many still in use
 - willow bark tea precursor to aspirin
- Some have been lost
 - Greek and Roman women used silphium as an effective contraceptive for 1,000 yrs - now extinct
- Standard medical reference for 1500 years



Silphium or Silphion

- A plant in the genus Ferula parsley family
- Related to giant fennel (not the cooking herb)
- Used by ancient women for contraception
- During Greek and Roman Civilization, rare plant growing in a narrow 30 mile band along the dry mountain sides facing the Mediterranean Sea in northern Africa near the city of Cyrene (area is now part of Libya)

Silphium on Ancient Greek Coins





After Fall of Rome

- Little new knowledge was added in Europe during the Dark Ages
- De Materia Medica was copied and recopied
 - New illustrations
 - Translations into other languages
 - Annotations
 - Some of the most famous copies made during this time
- Knowledge added in Arab world



During the Middle Ages

- Western knowledge preserved in monasteries
- Manuscripts were translated or copied for monastery libraries
- The monks gathered herbs in the field, or raised them in their own herb gardens
 - These were prepared for the sick and injured
- Monastery gardens still may be found in many countries



The First Apothecary Shops

- First drug stores established by Moslems in Bagdad late in the 8th century
- Arab physicians not only preserved the Greco-Roman wisdom, but added to it
- When the Moslems swept across Africa, Spain and southern France, some of their practices were introduced to Europe
- Crusades introduced more Islamic plant knowledge and practices back to Europe

Avicenna

- Ibn Sina (about 980-1037 A.D.), a Persian who was called Avicenna by the Western world
- Pharmacist, poet, physician, philosopher and diplomat considered a genius
- His pharmaceutical and medical teachings were accepted as authority in the West until the 17th century



- Beginning of Renaissance in the early 15th century saw a renewal of learning in all fields
- Botanically revival of herbalism for medicinal plants
- Coupled with the invention of the printing press in 1440 ushered in the Age of Herbals



- Beautifully illustrated books that described plants
- When to collect, useful parts
- Medicinal and culinary uses
- Also included a lot of misinformation and superstition
- Often advocated the Doctrine of Signatures



this firmoreuluitul rente corresqueripes de and diffe viit ipperate quate gri no ben carnem fir citriber hote Aragie distrabello referencere o cor ne arra Medullar no fur fue araquese hole ransfrigide ham quant make Haster wil andrew of he find a que face

R. anca opgrece Spalange de arabice Rei

rela dy mor Asancarela omb enoca.

Virel be commerced amore abdamague

tif timper ib inpoire febrefemar Sagur

nem defluction returer improitastulner

no cuto philite ferriamem. Sine numbre

conferra Great of four Com of ro cola.

del aurtum mitigat Aranca tratactin

porra planetta cu fra le touta ellementos

ing cortex and calle meet to fecta mile gu greitheat in amaritudine et pe cicare degeotice por fiers optoni elligite ace cortex atangtorin ponantrinad fra predidentplul momidie renoustage bif. f. mane et fero per deliver bene et ex trach shaqua pul minutalhine trerah ex pmittur bene ce ponie infufficien metle et itera coquar bene ca beculo en fonp squa do ne uraé incacalo er effenchi fixie appor penulbitib. 3 y 21 pulprism ferren de crufin unle from oforest et cal fact Therein extembrices occudes of tentioders reddie corcoforne flasteofi me Sue acte medialle arangie a resuno omeste maler cotterrer er eparaci laboranio shom bond appened fit. et lombrices necat

A where connection tabe visual A Klor marter ule Rolmarinum Anher pent ubi Pince A schor popul' ubi popul' A Hens martigenlitore E Sole cale to ner buildat defice et ebruta prete Steca certa Caccelles cumpres Terreaties rum spoket green or Oderad believes Anen

ox. de gruf a dise. Vraco foha be

a mitaralta dudopalmi

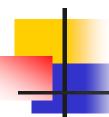
crecham all foll metale. Rades Estlemmer er tenunf Hafemir len beholis er folants gustu sala. Alecra eque folia cebathashi: fill's carriepen frafer tora et minora-flore pur paramet alore quane radicatoria lit. Dulinis bibes medion s. un bebere un mutil abilinet ola rompera antiatte et pettario fappointa comorel thericos opeleit. Vallerile agettacur. Itte final'é campula ciitta filie via Epdentae maximi piat efe chi.frca eximelle bibita fice it

A.P. gemomon hagmond School Regentum tunun denpla vino nel dramimpnesprotiber et findle de ar

Bretis et Pecudefrette pluc Arrentair invente maneerfannord für hunden the confidential property ficcitate cost ople ruf disence blester our ruse melior Enging could ga fibere digorar ton ading langu nem what ce marie it fiserie caffratt ou call cheaf wrum echiates repair the unde file towareis railung decrepun ga putdales the pellima Qd vio callramitie ou decersorti. Onis w decrepes mealors mountly for defe this guess deadlipeux defectio dueb et medif crare for terbelow idagena. Annua telasit medierel his oplexion mer liden tum bilitates ce umenti ficcirates Idomo cottenfestable fame medicated etad digeren dü facelioref Sangumer w. melicref givit



- Medicinal use recognized by distinct "signatures" visible on the plant which corresponded to human anatomy
 - Red juice of bloodwort to treat blood disorders
 - Lobed appearance of liverworts to aid the liver
- Belief in this concept developed independently among different cultures



Medicine and Botany

- During this time, medical schools were established in Europe
- Study of both medicine and botany
- Medical students knew the herbs
- These were the early botanists



- As science progressed, a dichotomy in medicine developed between practitioners of herbal medicine and regular physicians
- About this same time a similar split occurred between herbalism and scientific botany



Path to modern medicine

- Many herbal remedies had a sound scientific basis
- Some became useful prescriptions drugs
- William Withering was the first to scientifically investigate a folk remedy
 - His studies (1775-1785) of foxglove to treat dropsy (congestive heart failure) set standard for pharmaceutical chemistry



- Scientists began purifying the active extracts from medicinal plants
- Breakthrough in pharmaceutical chemistry came when Serturner isolated morphine from opium poppy in 1806
- First synthetic drugs were developed in the middle of the 19th century based on natural products

20th Century

- Direct use of plant extracts continued to decrease in the late 19th and 20th centuries
- Today medicinal plants still contribute significantly to prescription drugs
- 25% of prescriptions written in the U.S. contain plant-derived active ingredients
- 50% if fungal products are included
- An even larger percent based on semi-synthetic or wholly synthetic ingredients originally isolated from plants



- Renewed interest in investigating plants for medically useful compounds
- Recent success of taxol from the Pacific yew tree has shown this interest is worth pursuing



Growth of Alternative Medicine

- Dramatic increase in the use of alternative medical treatments
 - Complementary and Alternative Medicine CAM
- Refers to a wide range of therapies outside the mainstream of traditional Western medicine:
 - aromatherapy, acupuncture, biofeedback, chiropractic manipulation, herbal medicine, hypnosis, and massage therapy

CAM

- Plants and plant extracts (often called botanicals) figure prominently in alternative treatments
 - herbal remedies
 - aromatherapy
- Sales of herbal remedies amount to approximately \$3 billion per year in the U.S. and constitute close to 30% of the total sales for dietary supplements



Dietary Supplements

- Herbal remedies considered "dietary supplements" by the U.S. FDA
- Traditionally, dietary supplements referred to vitamins, minerals, other essential nutrients
- Dietary Supplement Health Education Act of 1994 expanded the category to include other products such as herbs, other botanicals, amino acids, and metabolites

FDA Regulations

- Dietary supplements are not required to undergo the same type of testing or approval that are required for prescription drugs or over-the-counter drugs
 - FDA requires extensive testing and clinical studies of drugs to determine their safety, proper dosages, effectiveness, possible side effects and interactions with other substances
 - Dietary supplements not subject to these

DSHEA

- Based on the DSHEA, the manufacturer of a dietary supplement is responsible for ensuring that the product is safe
- Prior approval is not required before sale
- FDA has responsibility to take action if a dietary supplement is later shown unsafe
- In 2001 comfrey (Symphytim officinale) removed from products due to liver toxicity

Herbal remedies

- Although not considered drugs by FDA, most contain active compounds that may offer health benefits or possibly cause adverse reactions
- 40% of US population using some form of CAM many do not tell physicians
- Many can react with prescription medication i.e.
 Ginkgo



- 75%-90% of the population in developing nations rely on herbal medicine as their only health care
- Medicinal herbs are sold alongside vegetables in village markets
- Practitioners of herbal medicine undergo extensive training to learn the plants, their uses, and preparation of remedies



- Traditional herbal medicine incorporated into a modern health care system
- Blend of herbal medicine, acupuncture, and Western medicine
- Thousands of species of medicinal herbs are available for the Chinese herbalist
- Chinese apothecaries contain an incredible assortment of dried plant specimens
- Prescriptions filled with blends of specific herbs

India

- Traditional systems separate from Western medicine
- At universities medical students are trained in Western medicine
- Most people use traditional systems:
 - Ayurvedic medicine Hindu origin
 - Unani medicine Muslim and Greek origin
 - Economics also a factor manufactured pharmaceuticals too expensive for most



- Interest in medicinal plants has focused on indigenous peoples in many parts of the world
- Ethnobotanists are spending time with local tribes and learning their medical lore before they are lost forever
- Especially important among native peoples in the tropical rain forests

Tropical rain forests

- Widespread destruction threatens to eliminate thousands of species that have never been scientifically investigated for medical potential
- Erosion of tribal cultures is also a threat to the knowledge of herbal practices
- As younger members of native groups are drawn away from tribal lifestyles, oral traditions are not passed on



WHO encourages the practice and improvement of traditional medicine

- 75 to 85% of the world's people still rely on traditional medicine to provide basic healthcare
- The native materia medica, derived from locally available medicinal plants, is the mainstay of this grass-roots ethnomedical system
- Documentation of these folk pharmacopoeias can expand the traditional healer's place in world
- Diagnostic criteria and diseases in conventional medicine need to be correlated with those in traditional medicine