Pharmacognosy – I

(Unit – I)

(Defination , History & Scope Of Pharmacognosy)

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INTRODUCTION

Definition:

In simple words: Pharmacognosy is the study of plants or other natural sources as a possible source of drugs.

The term comes from two Greek words: "*pharmakon*" meaning drug or medicine, and *"gnosis*" meaning knowledge. Pharmacognosy is "the study of the physical, chemical, biochemical and biological properties of drugs, drug substances or potential drugs or drug substances of natural origin as well as the search for new drugs from natural sources". Pharmacognosy is the study of medicinal uses of various naturally occurring drugs and its history, sources, distributions, method of cultivation of active chemical constituents, medicinal uses, identification test, preservation methods, substituents and adulterants. Plant preparations are said to be medicinal or herbal when they are used to promote health beyond basic nutrition. The study of drugs from plants includes the subjects of botany, chemistry and pharmacology. Botany includes the identification (taxonomy), genetics, and cultivation of plants. Chemical characterization of includes the isolation, identification and quantification of constituents in plant materials. Pharmacology is the study of the biological effects that the chemicals in medicinal plants have on cell cultures, animals and human practical perspectives as follows;

- Quality control (identity, purity, consistency)
- Efficacy (therapeutic indications, pharmacological investigations)
- Safety (adverse reactions, drug interactions, contraindications, precautions)

Crude Drugs:

Crude drugs are the drugs, which are obtained from natural sources like plant, Animals, minerals, marine, microorganisms and they are used as they occur in nature without any processing except, drying & size reduction. Crude drugs is referred to the natural product that has not been in advanced in value or improved in condition by any process or treatment beyond that which is essential for its proper packaging and prevention from deterioration.

History of Pharmacognosy:

The term "pharmacognosy" was used for the first time by the Austrian physician J.A. Smith in 1811 and 1815 by C.A. Sydler (Medical Student) in his work titled ‘’Analecta Pharmacognostica’’.

Originally—during the 19th century and the beginning of the 20th century—"pharmacognosy" was used to define the branch of medicine or commodity sciences, which deals with drugs in their crude, or unprepared, form. Crude drugs are the dried, unprepared material of plant, animal or mineral origin, used for medicine.

As late as the beginning of the 20th century, the subject had developed mainly on the botanical side, being particularly concerned with the description and identification of drugs both in their whole state and in powder form. Such branches of pharmacognosy are still of fundamental importance, particularly for pharmacopoeial identification and quality control purposes, but rapid development in other areas has enormously expanded the subject. The advent of the 21st century brought a renaissance of pharmacognosy and its conventional botanical approach has been broadened up to molecular and metabolomic level.

Drug discovery from natural products have played and continue to play an invaluable role sources of drugs or lead compounds in the prophylaxis and treatment of diseases. Plants, especially those with pharmacological uses have been the primary sources of medicines and have an advantage over other sources in drug discovery for various reasons.

In about 77 AD, Dioscorides, a Greek doctor, kept a record of about 600 kinds of crude drugs in his compiled book De Materia Medica, a book that had played an important role in pharmacology and botany.

In 1815, CA. Seydler, a German who used the word 'Pharmakognosie" in his book named Analecta Pharmacognostica , he was also referred to as the father of pharmacognosy.

Work of Galen: -(131 -200)

Galen was Greek pharmacist; he worked on extraction of chemical constituent from the plants. He developed various methods of extraction therefore the branch of pharmacy which deals with extraction of chemical constituent from plants & animals is called as Galenical Pharmacy.

Hippocrates (460 - 360. B.C.)

Before the birth of Jesus. He was Greek scientist; He worked on human anatomy & physiology Particularly on circulatory system & nervous system. He prepared famous oath for physicians, which is still taken by the physicians, He is known as father of medicine.

Indian History of pharmacognosy:

It is about 5500 years old, the suktas of Rigveda & Atharwaveda medicinal property of plant is given. There are several medicinal plants, which are given with their use. The old Ayurveda Books, Charak samhita & Sushrutsamtita described many medicinal plants.

HISTORY:

History of pharmacognosy is as old as mankind. Human being came to know medicines from nature itself. Table 1.1 is explaining various historical developments which together contributed to the progress of Pharmacognosy. Various traditional systems of medicines from different corners of world also played vital role in development of pharmacognosy.

Table 1.1

Name	***Profession***	***Work***	***Period***
Hippocrates *Father of Medicine*	Greek scientist	Studied human anatomy and Physiology	460-360 B.C
Aristotle *Father of Biology*	Greek Philosopher	Animal kingdom	384-322 B.C.
Theophrastus *Father of Botany*	Greek Philosopher	Plant kingdom	370-287 B.C.
Pedanius Dioscorides	Greek physician	De Materia Medica book is compilation of several plants	78 A.D.
Gaius Plinius Secundus or Pliny the Elder	Roman naturalist	Encyclopedic work Entitled	25-70 A.D.
Aelius Galenus or Claudius Galenus or Galen	Greek pharmacist	Galenical Pharmacy	131–200 A.D.

Carl Linnaeus *Father of Taxonomy*	Swedish botanist	Binomial classification	1753
C A Seydler	German scientist	Coined wordPharmacognosy	1815
Sir Joseph D. Hooker	British botanist	Plant nomenclature	1817-1911
George Bentham	English botanist	Plant nomenclature	1800-1884
Charles Darwin	English naturalist	Evolutionary theory	1809-1882
Friedrich Sertürner	German chemist	Isolated first alkaloid morphine from opium	1804
Mikhail Tsvet	Russian scientist	Separation of plant pigments by chromatography	1900

Alternative Systems of Medicine

Ayurveda System

It is about 5000-year-old system of medicine native to India. It is holistic system of medicine which considers whole body while treating disease and not just a diseased part of body. Ayurveda has thousands year's evidence-based history so it can be just complete system rather alternative system or complementary system. Ayurveda is a Sanskrit word which means (Ayur-life and veda – to gain knowledge or science) science of life. Ayurveda deals with different types of plants, minerals and animal products. Charak samhita by Charak includes the principle components or theory of Ayurveda. Sushrut samhita edited by Sushrut is about the surgical treatments in Ayurveda.

Theory and principles: Ayurveda involves following fundamental principles:

- ***Triguna***: Satva (good), Raja (aggressive), Toma (dullness).
- ***Tridosha:*** (Kapha- lubrication, Vatarespiration and Pitta-metabolism),
- ***Panchshil: (Rasa :*** Therapeutically active substances, Guna : Quality Virya : Active principle and potency, Vipaka : The end product of digestion, Prabhava : Actual effect of drug on body),
- ***Panch Mahabhuta:*** (earth, water, sky, fire and air),
- ***Saptadhatu*** [(Rasa (Plasma), raktam (Blood), mamsa (Muscles), meda (Fat), asthi (Bone), majja (Bone marrow and nerves), shukra (Reproductive fluid or Semen)]

Diagnosis: When non-equilibrium between any of above principles causes to person suffers from diseases. Ayurveda cures the cause of disease by considering to mental, physical, social and spiritual welfare of human beings. Observation of body color, tongue, nail, eyes, pulse and investigation of blood, urine and fecal matter is criteria of diagnosing actual cause of disease.

Treatment: Panchakarma is an important treatment in Ayurveda which includes snehan (massage), swedan (steam), vaman (vomit), virechan (expulsion) and basti (medicated enemas). The medicines are given in the form of powder (churna, bhasma), liquid (asava, arishta and taila), semisolid (leha or paka) and tablets (gutika, vati). Treatment of ayurveda involves use of drugs obtained from plant, animal and mineral sources. Dosage forms of ayurveda are powders (churna), bhasma (oxides of metals), quath (extracts), gutika (pills), lep (ointment), asava and arishtha (alcohol containing liquids) or taila (medicated oils). There are eight branches of Ayurveda: 1. Kayachikitsa (internal medicine) 2. Kumarbhritya (pediatrics) 3. Trachchikitsa (psychology medicine) 4. Shalakya Tantra (ear, nose and throat) 5. Shalya Tantra (surgery) 6. Agada Tantra (toxicology) 7. Rasayana Tantra (geriatrics) 8. Vajikaran Tantra (gynecology)

Siddha System

Siddha system of medicine is one of the oldest medical systems known to mankind even before ayurvedic system which was flourished in Vedic culture, Dravidian culture and Indus Valley Civilization. This system of medicine originated from Tamil traditional medicine. The most of literature of this system is given in Tamil Language. 18 "Siddhas" (Spiritual persons) developed this system so it is called as Siddha. Sage Agathiyar is considered the guru of all Sidhas. According to Palm Leaf manuscript, it is believed that it was first described by Lord Shiva to his wife Parvathy and then to their son Lord Muruga. Then he taught all their knowledge to his disciple sage Agasthya. Agasthya taught 18 Siddhars and they spread this knowledge to human beings. Siddhars have to get Siddhi means attainment of supernatural powers.

Theory and principles:

Generally, the basic principles of the Siddha medicine are almost similar to ayurveda. The only difference appears is that the siddha system explains in detail about various basic treatments of diseases while Ayurveda where surgeries like modern treatments are practiced and written in detail. Siddha system is based on 96 principles and out of these Triguna theory, i.e., vata, pitta and kapha is more prominent. Under normal conditions, the ratio between Vata, Pitta, and Kapha is 4:2:1, respectively. Siddha deals with thousands of herbs, animal, mineral and metals. Like in Ayurveda, in Siddha medicine also, the physiological components of the human beings are classified as vata (air), pitta (fire) and kapha (earth and water). Siddha system believes that health is perfect state of physical, mental, social, moral and spiritual component. It is based on Andapinda Thathuvam means relationship between universe and human body. Siddhas are called as Vaithiyars.

Diagnosis: A Siddha physician studies eight important things of body i.e. nadi (pulse), kan (eyes), swara (voice), sparisam (touch), varna (colour), na (tongue), mala (faeces) and neer (urine).

Guna	***Personalities***	***Complications***
Vata	Stout, black, cold and inactive healthy	Increased Vata shows arrogant behavior paralysis, heart attack.
Pitta	Lean, whitish complexion and perfectionist	Increased Pitta shows graying of hair, anemia and instability.
Kapha	Well built, good complexion and well behaved	graying of hair, causes jaundice, heart attack.

Treatment:

Internal as well as external medicines are divided into 32 categories each separately. Pressure or massage techniques, are also part of treatment and called as Thokkanam. There are 108 varma points for pressure techniques. Treatment is classified into three categories: devamaruthuvum (Divine method); manuda maruthuvum (rational method); and asura maruthuvum (surgical method). In Divine method medicines like parpam, chendooram, guru, kuligai made of mercury, sulphur and pashanams are used. In the rational method, medicines made of herbs like churanam, kudineer, vadagam are used. In surgical method, incision, excisions, use of heat or leech are used. Treatment in this system emphasizes preparation of fresh medicine. It is then prepared and administered with some Pathya (some restriction). E.g., Day time sleeping is not allowed or some food material is restricted like chicken, mango, coconut, mustard, groundnut, almond, tobacco etc. Medicine can be kashayam (extract), churnam (powder), tailams (medicated oil), gulligai (pills), chenduram (metal), bhasmam (calcination product) and or ghritam (medicated ghee)

Unani System

This system is also called as unani-tibb or yunani medicine which was developed by arab and persian physicians such as Rhazes (al-Razil), Avicenna (ibn sena), Al-zahrawi, and Ibn nafis.

Book: Ibn Sina's The Canon of Medicine

Theory and principles:

Unani medicine involves concept of the four humours (akhlat) i.e. Phlegm (Balgham), Blood (Dam), Yellow bile (bafrâ') and Black bile (Saudâ'). These "humors" are believed to have its roots in the appearance of a blood sedimentation test made in open air, which exhibits a dark clot at the bottom (black bile), a layer of unclotted erythrocytes (blood), a layer of white blood cells (phlegm) and a layer of clear yellow serum (yellow bile). Abnormality in humor leads to disease condition in body.

Diagnosis:

The human body is considered to be made up of seven components, which have direct bearing on the health status of a person. They are 1. Elements (Arkan) 2. Temperament (Mijaz). 3. Humors (Aklat) 4. Organs (Aaza) 5. Faculties (Quwa) 6. Spirits (Arwah) 7. Functions (Afaal). These components are taken in to consideration by the physician for diagnosis and also for deciding the line of treatment. In diagnosis Unani Physican (Hakim) ask a patient a lot questions to know history and decides treatment.

Treatment:

After diagnosing the disease, treatment involves either to eliminate cause (Izalae sabab), normalize humors (tadeele akhlat) or to normalise tissues or organs (tadeele aza). Method of treatment involves modification of essential pre-requisites of health (Ilaj-bil-tadbeer) or panchkarma like in Ayurveda (Ilaj-bil-tadbeer) or pharmacotherapy (Ilaj-bil-advia) or surgery (Ilaj-bil-yad). As far as possible unani medicine therapy attempts to use simple physical means to cure a disease. Some of the techniques used in Ilaj-bil-tadbeer (regimental therapy) include hijamah (cupping), fasd (venesection), tareeq (sweating), idrar-e-baul (diuresis), hamam (turkish bath), dalak (massage), kai (cauterization), ishal (purging), qai (vomiting), riyazat (exercise) and taleeq (leeching).

The bases are generally purified by adding aab leemun (lemon juice), sat leemun (lemon extract) or shibb-e-yamani (alum) etc., before making the qiwam. Afterwards, the ingredient drugs are mixed in qiwam to prepare majun, itrifal, laboob, tiryaqat or mufarreh. For making majun or any of its preparations, the consistency of qiwam for majun is three Tars. The consistency of qiwam for laooq is two tars.

Word Majun is derived from Ajn, which means to mix. In this preparation powder of drugs is mixed well in qiwam (basic solution of particular consistency) of sugar or asl (honey). Their names are given on the name of inventor, chief ingredients or action. Like majun sheikhurrais is named on inventor. majun mullein is named due to its laxative action. Majun azaraqi, as azaraqi is chief ingredient. So itrifal (triphala), jawarish (digestive tonic), yaqooti (ruby containing), bershasha are all majun but according to composition use ingredient preparation method, and other properties, their names are different.

Homeopathy System

Homeo means 'similar' and Pathos means 'suffering' so homeopathy is the "system of similar suffering". German physician Samuel Hahnemann first stated the basic principle of homeopathy in 1796, known as the "law of similars" (let like be cured by like").

Theory and principle:

Homeopathy emphasises the root cause of the disease and the nature's law of its cure that is 'like cures like'. Thus, homeopathy deals with the following seven principles which are outlined below:

- Individualization: No two individuals in the world are alike, i.e., the disease affecting two individuals cannot be similar though they may share common symptoms. Therefore, the medicines used to cure the same disease in different individuals are different.
- Principle of similar: Use of the medicine will produce similar symptoms of disease in a healthy individual. For example, an onion is a substance, which makes your eyes water and your nose burn. If you are having an attack of hay fever with watering eyes and a burning nose, a homeopathic remedy made from onion can relieve it.
- Principle of simplex: Only one single simple medicine at one time and no combination is allowed.
- Minimum dose: Minimum medicine at a time.
- Law of proving: Medicine should have the capacity to produce disease state in a healthy individual.
- Law of dynamisation: Medicine should preserve the normal state of healthy body.
- Vital force: Medicine should have the capacity to arouse sufficient energy to maintain a healthy body.

Diagnosis:

It involves knowing of complete hereditary history as well as observation of moods, habits, skin, eyes, tongue, blood, urine etc., of patients.

Treatment:

When the symptoms picture matches with the drug picture, the physician always attempts to identify a single medicine. In producing remedies for diseases, homeopaths use a process called "dynamisation" or "potentiation", whereby a substance is diluted with alcohol or distilled water and then vigorously shaken in a process called "succussion". Three logarithmic potency scales are in regular use in homeopathy for dilution. Hahnemann created the "centesimal" or "C scale", diluting a substance by a factor of 100 at each stage. Homeopathic pills are made from an inert substance (often sugars, typically lactose), upon which a drop of liquid homeopathic preparation is placed. Hahnemann began to test what effects substances produced in humans, a procedure that would later become known as "homeopathic proving".

The Scope of Pharmacognosy:

- Pharmacognosy gives a sound knowledge of the vegetable drugs under botany and animal drugs under zoology.
- It also includes plant taxonomy, plant breeding, plant pathology, plant genetics and by this knowledge one can improve the cultivation methods for both medicinal and aromatic plants.
- Now a days phytochemistry (plant chemistry) has undergone the significant improvement.
- This includes a variety of substances that accumulated by plants and synthesized by plants.

A vital link between pharmacology and medicinal chemistry:

- ✓ Newly detected plant drugs are converting into medicine as purified phytochemicals
- ✓ Pharmacognosy is essential for the evolution of new medicines because crude drugs are used for the preparation of galenical or as a source of therapeutically active metabolites.
- ✓ In short Pharmacognosy is an important link between pharmaceuticals and basic science well as ayurvedic and allopathic system of medicines.
- ✓ Pharmacognosy is a science of active principles of crude drugs and which can be help in dispensing, formulating, and manufacturing of dosage forms.
- ✓ In other way the complete knowledge of pharmacognosy will help in recent trend that is in industries.
- ✓ As a research tools and in drug delivery systems, and all the departments of pharmaceuticals and one can improve the healthcare facilities across the world.

Role of Pharmacognosy

- ➢ Pharmacognosy is important branch of pharmacy which is playing key role in new drug discovery and development by using natural products. Pharmacognosy has given many leads for new drug discovery and development.
- ➢ It is an important link between modern medicine systems (allopathy) and traditional system of medicine. It is a part of medicinal system which is affordable as well as accessible to common man. As part of integrative system of medicine, pharmacognosy can help to increase effectiveness of modern medicine system.
- ➢ It is acting as a bridge between pharmacology, medicinal chemistry and pharmacotherapeutics and also pharmaceutics. It also bridges pharmaceutics with other pharmacy subjects.
- ➢ More than 60 percent of world population is still using natural product for their primary healthcare needs. Pharmacognosy can provide safe and effective drugs in combination with modern medicine system.
- ➢ Pharmacognosy includes knowledge about safe use of herbal drugs including toxicity, side effects, drug interaction thereby increasing effectiveness of modern medicine.
- ➢ Pharmacognosy is an important link between pharmacology and medicinal chemistry. As a result of rapid development of phytochemistry and pharmacological testing methods in recent years, new plant drugs are finding their way into medicine as purified phytochemicals, rather than in the form of traditional galenical preparations.
- ➢ Pharmacognosy is the base for development of novel medicines. Most of the compounds obtained from natural product serve as prototype or base for development of new drug which are more active and less toxic.
- ➢ By means of pharmacognosy, natural products can be dispensed, formulated and manufactured in dosage forms acceptable to modern system of medicine.
- ➢ There are vast number of plant and animal species which are not studied systematically.
- ➢ Development of pharmacognosy also leads to development of botany, taxonomy, plant biotechnology, plant genetics, plant pathology, pharmaceutics, pharmacology, phytochemistry and other branches of science.