

Available online on 15.12.2025 at <http://jddtonline.info>

Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

Copyright © 2025 The Author(s): This is an open-access article distributed under the terms of the CC BY-NC 4.0 which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited



Open Access Full Text Article



Review Article

Historical Evolution of *Ilmul Wasaful Aqaqeer*: Foundations and Advances in Unani Pharmacognosy

Abudullah ^{1*}, Yasmeen Khan ², Labeeb Shaida ², Abdul Kabeer ², Rumana Khatoon ³, Naseem Ahmad ²¹ Assistant Professor, Department of Ilmul Advia (Pharmacology) Deoband Unani Medical College Hospital& Research Centre Deoband, 247554² Department of Ilmul Advia (Pharmacology) National Research Institute of Unani Medicine for Skin Disorders, Hyderabad 500038,³ Assistant Professor Department of Ilmul saidla (Pharmacy) Deoband Unani Medical College Hospital& Research Centre Deoband 247554

Article Info:



Article History:

Received 18 Sep 2025

Reviewed 10 Nov 2025

Accepted 29 Nov 2025

Published 15 Dec 2025

Cite this article as:

Abudullah, Khan Y, Shaida L, Kabeer A, Khatoon R, Ahmad N, Historical Evolution of *Ilmul Wasaful Aqaqeer*: Foundations and Advances in Unani Pharmacognosy, Journal of Drug Delivery and Therapeutics. 2025; 15(12):175-182 DOI: <http://dx.doi.org/10.22270/jddt.v15i12.7459>

*For Correspondence:

Abudullah, Assistant Professor, Department of Ilmul Advia (Pharmacology), Deoband Unani Medical College Hospital& Research Centre, Deoband, 247554

Abstract

Ilmul Wasaful Aqaqeer, commonly referred to as pharmacognosy in the Unani system of medicine, is the branch of science that deals with the study of crude drugs obtained from natural sources, including plants, minerals, and animal products. This discipline has been an integral component of Unani medicine since its inception, with its foundations rooted in Greco-Arabic medical traditions and classical Indian practices. The historical development of *Ilmul Wasaful Aqaqeer* reflects the synthesis of ancient knowledge from civilizations such as Mesopotamia, Egypt, Greece, Rome, China, and India, later enriched during the Golden Age of Arabic medicine. Key contributions by luminaries such as Hippocrates, Dioscorides, Galen, Al-Razi, and Ibn Sina laid the groundwork for systematic classification, authentication, and therapeutic application of medicinal substances. In the Indian context, Unani scholars incorporated and validated pharmacological knowledge, complementing Ayurveda and local folk practices. Modern pharmacognosy continues to evolve, integrating molecular biology, DNA barcoding, nanotechnology, and phytochemical research, while maintaining its roots in classical Unani principles. This review traces the historical evolution of *Ilmul Wasaful Aqaqeer*, highlights its contributions to drug discovery, and underscores its relevance in contemporary herbal medicine and pharmaceutical research.

Keywords: Unani Medicine, *Ilmul Wasaful Aqaqeer*, Pharmacognosy, Historical Development.

1. Introduction

Pharmacognosy, derived from the Greek words *pharmakon* (drug) and *gnosis* (knowledge), is the scientific study of medicinal substances obtained from natural sources, including plants, minerals, and animals. Within the Unani system of medicine, this discipline is traditionally known as *Ilmul Wasaful Aqaqeer*, which focuses on the identification, authentication, classification, and therapeutic application of crude drugs. The study of medicinal substances has been an integral component of Unani medicine since its origins, reflecting a synthesis of Greco-Arabic medical principles, Persian scholarship, and Indian medicinal knowledge.

Over the centuries, *Ilmul Wasaful Aqaqeer* evolved from empirical observation to a more systematic scientific discipline. Classical Unani texts detailed organoleptic, morphological, and therapeutic properties of drugs, which laid the foundation for modern pharmacognosy. With the advent of modern analytical techniques—such as thin-layer chromatography, high-performance liquid

chromatography, DNA barcoding, and nanotechnology—the discipline has expanded to include molecular authentication, phytochemical analysis, and nano-phytopharmaceutical development.

Today, pharmacognosy continues to serve as a bridge between traditional knowledge and modern medicine, providing insights into drug discovery, herbal therapeutics, and quality control of natural products. Understanding the historical evolution of *Ilmul Wasaful Aqaqeer* not only highlights its contribution to Unani medicine but also emphasizes its enduring relevance in contemporary healthcare, pharmaceutical research, and global herbal medicine markets.

2. Materials and Methods

This study was conducted as a comprehensive historical and literature review aimed at tracing the evolution of *Ilmul Wasaful Aqaqeer* (Pharmacognosy) within the framework of Unani medicine. A systematic literature search was performed using databases such as PubMed, Scopus, Google Scholar, Web of Science, and institutional

libraries. The search employed keywords including “*Ilmul Wasaful Aqaqeer*,” “*Pharmacognosy*,” “*Unani medicine*,” “*herbal medicine*,” “*crude drugs*,” and “*history of medicine*.” Relevant classical Unani texts, pharmacopoeias, historical manuscripts, and peer-reviewed scholarly articles were included, particularly those documenting the identification, classification, and therapeutic applications of crude drugs. Sources that lacked historical relevance or focused solely on modern pharmacology were excluded. Extracted data covered aspects such as historical origins, major contributors, classical literature, and the evolution of pharmacognostic practices, which were then organized chronologically from ancient civilizations to the modern era. A narrative synthesis approach was adopted to integrate historical insights with contemporary pharmacognostic developments, highlighting the continuity between classical Unani concepts and modern scientific perspectives.

3. Result

3.1 Definition of Pharmacognosy:

The term *Pharmacognosy* is derived from the Greek words:

“**Pharmakon**” meaning *drug* and “**Gnosis**” meaning *knowledge*.

Thus, *Pharmacognosy* literally translates to “knowledge of drugs”.¹

According to the American Society of Pharmacognosy (ASP),

*“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.”*²

The European Scientific Cooperative on Phytotherapy (ESCOP) defines *Pharmacognosy* as “*The discipline dealing with the scientific study of medicinal plants and herbal substances, covering their identification, authentication, quality control, standardization, and clinical use.*”³

According to the World Health Organization (WHO)

“Pharmacognosy is the study of crude drugs of plant, animal, and mineral origin, including their biological, chemical, biochemical, and physical properties.”(World Health Organization, 1998).⁴

Hence, *Pharmacognosy* serves as the foundation for understanding the nature, sources, and therapeutic potential of natural substances, playing a crucial role in the history and evolution of traditional and modern medicine.

3.2 History of Pharmacognosy:

The term *Pharmacognosy* was first used by the Viennese pharmacist Adam Schmidt (1759–1809) in his posthumously published book *Lehrbuch der Materia Medica* (1811). Subsequently, it was employed by the Polish pharmacist Enoteus C. A. Seydler in *Analecta*

Pharmacognostica (1815), establishing the formal scientific use of the term.^{5,6}

Ancient Period (Prehistoric to 200 AD)

During the ancient period, pharmacognostic knowledge was primarily observation-based. Early civilizations including Egyptian, Indian, Chinese, Greek, and Roman societies meticulously documented medicinal plants and minerals in texts that laid the foundation for systematic study in later periods.^{7,8}

Old Slavic Traditions

Among Old-Slavic nations, traditional healers used roots of forest trees for treating fractures of hands and feet, although the exact species remain unknown. Slavic herbalists were familiar with trees such as oak (*Quercus*), birch (*Betula*), willow (*Salix*), beech (*Fagus*), ash (*Fraxinus*), poplar (*Populus tremula*), yew (*Taxus*), pine (*Pinus*), spruce (*Abies*), thuja (*Juniperus*), elm (*Ulmus*), alder (*Alnus*), linden (*Tilia*), and maple (*Acer*). Fruits such as hazelnuts, apples, and cherries were collected from the wild, as evidenced in Neolithic European settlements.^{9,10}

Mesopotamian Medicine (3000–2000 BCE)

The earliest recorded pharmacotherapy comes from Babylonian and Assyrian sources, inscribed on cuneiform clay tablets. The world’s oldest known recipe book, excavated in Iraq, lists twelve medical recipes, including ingredients such as salt, myrrh (*Commiphora myrrha*), thyme (*Thymus vulgaris*), figs (*Ficus carica*), dew (Shabnam), milk, leather, and turtle shell (*Trionyx sinensis*) (Raudzens, 1993). Mesopotamians cultivated figs, onions, flax seeds, and barley for food and medicinal purposes, while leaves from cypress (*Cupressus sempervirens*), cedar (*Cedrus deodara*), and oak (*Quercus infectoria*) were applied therapeutically.¹¹

Ancient Egyptian Medicine

Egyptian medicine was closely tied to religion, treating diseases as either divine punishment or a natural imbalance. Medical papyri document both magical and empirical therapies:

Kahun Papyrus (1850 BCE): Focused on gynecology, fertility, pregnancy, and female disorders.

Edwin Smith Papyrus (1600 BCE): A surgical treatise based on a 3000 BCE manuscript, providing guidance for head, neck, and abdominal injuries, including the earliest neurological observations.

Ebers Papyrus (1550 BCE): Encyclopedic in scope, discussing anatomy, physiology, internal diseases, tumors, and their treatments.¹²

Egyptian healthcare emphasized moderation in diet, hygiene, sexual health, waste disposal, clean water, nutrition, body care, and burial practices.¹³

Ancient Chinese Medicine

Traditional Chinese Medicine (TCM) traces its origins to Emperor Huangdi (c. 2500 BCE), credited with compiling the Huangdi Neijing (Yellow Emperor’s Inner Canon), a

foundational text covering diagnosis, acupuncture, herbal medicine, physiology, and pathology.

Shennong Bencao Jing (Divine Farmer's Materia Medica): Earliest Chinese pharmacognostic text describing 365 medicinal substances (herbs, minerals, animal products).

Treatise on Cold Damage by Zhang Zhongjing: Systematic description of infectious and feverish diseases.

Bencao Gangmu by Li Shizhen (16th century): Monumental encyclopedia cataloging 1,892 medicinal substances and approximately 11,000 prescriptions.^{14,15}

These texts laid the foundation for classification and systematic study of crude drugs, which remain influential in modern pharmacognosy.

Vedic Period (ca. 1500–600 BCE)

Vedic medicine in India combined religious rituals, incantations, and herbal remedies. Healing was associated with divine forces, including the Ashwini Kumars and Rudra. The Atharvaveda contains the earliest detailed records of medicinal plants (~290 species) forming the basis of Ayurveda.¹⁶

Rigveda: Mentions many herbs (Oshadhi Sukta) and their healing properties.

Atharvaveda: Earliest record of Indian materia medica.

Yajurveda & Samaveda: Indirect references to diet, health, and ritual medicines.

Greek and Roman Contributions to Medicine and Pharmacy

Greek and Roman civilizations laid the foundations for the systematic development of medicine and pharmacy. Early Greek medicine was closely intertwined with religion, and the priests of Asclepius functioned as both healers and pharmacists. Their temples, known as Asklepieia, combined elements of hospitals and health resorts, where treatments included prayers, rituals, diets, and medicinal preparations.¹⁷

1. Early Greek Foundations

Greek and Roman culture provided the basis for the sciences, including pharmacy. In ancient Greece, medicine and religion were inseparable; priests of Asclepius served as both physicians and pharmacists.

Approximately 185 Asklepieia existed across Greece. In 293 BCE, during a plague, the cult of Asclepius was introduced into Rome.

Treatments included prayers, sacrifices, dietary regimens, and the preparation of medicinal remedies.^{18,19}

2. Hippocrates (460–370 BCE)

Regarded as the Father of Medicine, Hippocrates established principles of rational medical practice.

He documented the medicinal properties of plants such as beans (*Phaseolus vulgaris*), peas (*Pisum sativum*), millet (*Panicum miliaceum*), lentils (*Lens culinaris*),

linseed (*Linum usitatissimum*), sage (*Salvia officinalis*), lupine (*Lupinus albus*), cucumber seed (*Cucumis sativus*), sesame (*Sesamum indicum*), saffron (*Crocus sativus*), and poppy seed (*Papaver somniferum*).

He also employed garlic (*Allium sativum*), mustard (*Brassica nigra/Sinapis nigra*), clover (*Trifolium pratense*), sorrel (*Rumex acetosella*), cabbage (*Brassica oleracea*), mint (*Mentha pulegium*), oregano (*Origanum vulgare*), and radish (*Raphanus sativus*) therapeutically.^{20,21}

3. Theophrastus (371–287 BCE)

Known as the Father of Botany, Theophrastus authored *De Causis Plantarum* and *De Historia Plantarum*, focusing on plant morphology, description, and medicinal uses.

He was the first to mention fern (*Filix*) as a remedy against intestinal worms.¹⁹

4. Asclepiades (1st century BCE)

A prominent physician, Asclepiades emphasized natural therapies such as heat, cold, and sunlight.

He studied the therapeutic effects of Greek and Roman wines and introduced balms, vaginal suppositories, eye and ear medicines, and bitter tonics.

He criticized superstitious remedies, favoring rational therapeutic approaches.²²

5. Dioscorides (1st century CE)

A Greek pharmacologist, Dioscorides authored the monumental *De Materia Medica*, considered the greatest ancient text on medicinal substances.

His work, composed of five books, describes:

- Aromatic substances, oils, and ointments
- Trees, resins, and fruits
- Animal products (wax, milk, etc.)
- Grains, vegetables, roots, seeds, and wine
- Minerals and metals

He detailed methods for drug identification, preparation, and therapeutic application, including anti-inflammatory remedies. Notable plants include fenugreek, mallow, coriander, garlic, mustard, ivy, centaury, tragacanth, sage, squill (*Scilla maritima*), among others.

De Materia Medica was later translated into Latin during the Gothic reign (493–553 CE) and became foundational for subsequent pharmacology.^{19,23}

6. Galen (129–210 CE)

Galen built upon the works of Hippocrates and Dioscorides, advancing Roman medicine to its classical peak.

He authored 11 books on the “Mixing and Characteristics of Simple Medicines” and works on drug classification by nature and site of action.

Galen's systematic approach laid the foundation for Galenic pharmacy, profoundly influencing Byzantine, Arabic, and later European medicine. With him, ancient

medical-pharmaceutical knowledge achieved its highest classical development.^{19,22}

Golden Age of Arabic Medicine (8th–15th Century)

The period between the 8th and 15th centuries is widely regarded as the Golden Age of Arabic Medicine, marked by extraordinary advances in medicine, pharmacy, and related sciences. Eminent scholars such as *Yuhann ibn Masawayh*, *Hunayn ibn Ishaq*, *Sabur ibn Sahl*, *Ali ibn Sahl al-Tabari*, *al-Razi (Rhazes)*, *al-Majusi*, *al-Zahrawi*, *al-Biruni*, *Ibn Sina (Avicenna)*, *Ibn Jazlah*, *Ibn al-Baitar*, and *Ibn al-Nafis* preserved, systematized, and expanded upon the medical heritage of Greece, Rome, Persia, and India.^{24,25,26}

Al-Razi (865–925 CE) authored over 200 works, including the *Liber Medicinalis Almansoris* and the encyclopedic *al-Hawi (Continens)*. His *Antidotarium* offered systematic guidance for preparing compound medicines, and he introduced methods of herbal extraction for pill-making, significantly advancing pharmacological practice.²⁴

Ibn Sina (Avicenna, 980–1037 CE), known as the “Prince of Physicians”, synthesized Greco-Roman, Indian, and Arabic knowledge. His monumental *al-Qanun fi'l-Tibb (Canon of Medicine)* became a standard medical reference in the Islamic world and medieval Europe. The text describes over 760 simple and compound drugs, their properties, modes of action, and therapeutic uses. Avicenna also addressed ophthalmology, anatomy, distillation, and the preparation of rose essence for medicinal purposes. His *Kitab al-Shifa (Book of Healing)* further cemented his enduring influence.^{25,27}

Ibn al-Baitar (1197–1248 CE) the foremost Arab botanist, compiled a comprehensive materia medica describing around 1,400 simple drugs, 300 of which were recorded for the first time. Arabic scholars introduced numerous substances, including camphor, senna, cinnamon, sugar, citrus fruits, pepper, jasmine, and galangal, many still used today.^{27,33}

Under Arab rule in Spain, particularly in Andalusia, pharmacology flourished alongside cultivation of medicinal plants and the introduction of economically and therapeutically valuable crops such as sugarcane, cotton, citrus fruits, and persimmon. The Golden Age preserved classical traditions while innovating in pharmacology, surgery, and botany, leaving a profound legacy for the Islamic world and medieval Europe.^{24,25}

Medicine and Pharmacy in the Middle Ages

During the Middle Ages, scientific progress slowed, but key scholars preserved and expanded classical pharmaceutical knowledge. Cassiodorus safeguarded classical texts, Walafrid Strabo described medicinal plants in his *Hortulus*, and Constantinus Africanus introduced Arabic medical knowledge to Europe through translations. Later, Valerius Cordus authored the first medical textbook and prepared the earliest pharmacopoeia.^{18,28}

Early medieval medicine and pharmacy were largely centered in churches and monasteries, but by the 11th

century, medical schools such as Salerno became prominent learning centers. In 1240 CE, physicians were legally prohibited from preparing medicines, marking the first formal separation between doctors and pharmacists. Regulation of drug preparation and pricing soon followed, with the earliest pharmacies appearing in southern Italy before spreading across Europe.²⁹

From the 10th century onward, Arabic medicine exerted a strong influence on Europe, particularly in alchemy and pharmacology. Italy became a hub for medical and pharmaceutical progress, and in 1488, Saladin published the first printed book on pharmacy.

The Renaissance (14th–16th Century)

The Renaissance marked a revival of science, literature, and art, with renewed interest in the classical works of Hippocrates and Galen. The period saw:

- Founding of the first botanical gardens in Italy.
- Establishment of the world's first department of pharmacognosy at the University of Padua in 1545.
- Publication of the New Kreuterbuch by Brunfels, Bock, and Fuchs in Germany, richly illustrating native flora and earning them recognition as the “fathers of pharmacobotany”³⁰
- Documentation of New World medicinal plants by Monardes, and the creation of the botanical garden at Leiden by Clusius, one of the oldest in Europe.

This era signaled the transition from medieval scholasticism to a scientific approach in medicine and pharmacy, laying the foundations of modern pharmacognosy and pharmacobotany.³¹

Indian Medicine: Classical Ayurvedic Period (ca. 600 BCE – 200 CE)

Following the Vedic age, Indian medicine entered its classical phase, marked by the emergence of Ayurveda as a systematic medical science. This period witnessed the composition of two seminal compendia, the Charaka Samhita and the Sushruta Samhita, which established the foundations of theoretical and practical medicine in India.^{32,33}

Charaka Samhita: Focused on internal medicine (Kayachikitsa), emphasizing the balance of the three humors (doshas: Vata, Pitta, Kapha) as central to health. It includes detailed accounts of diagnosis, prognosis, therapeutics, pharmacology, and ethical duties of physicians. Charaka described numerous plant-based remedies, minerals, and animal products, presenting one of the earliest systematic pharmacopoeias.³⁴

Sushruta Samhita: Concentrated on surgery (Shalyatantra), describing surgical instruments, operative techniques, wound management, and procedures such as rhinoplasty and cataract extraction, reflecting a highly advanced surgical tradition. Sushruta also elaborated on anatomy, physiology, and the use of medicinal plants in surgical care.³⁵

Pharmaceutical Botany and Pharmacy in the 17th Century

The 17th century witnessed continued progress in pharmaceutical botany, focusing on plants' medicinal value. Numerous regional floras were published, richly illustrated, contributing to botanical terminology and systematics.

Joseph Pitton de Tournefort (d.1708) classified plants into 22 groups, a system influential until Linnaeus.

Basilius Bessler (d. 1629) published the first botanical atlas.

Marcello Malpighi (1675) advanced plant anatomy through herbal studies.³⁶

A major milestone occurred in 1638, when the Countess of Chinchón was cured of malaria with Peruvian Cinchona bark. This drug was introduced into Europe, becoming a celebrated remedy for malaria and fevers.³⁷

Pharmaceutical laboratories evolved significantly, adopting alchemical equipment to prepare medicines and becoming centres for intellectual exchange. In Oxford, naturalists gathered at the home of pharmacist Cross, while in Paris, meetings at pharmacist Geoffroy's residence gave rise to the French Academy of Sciences in 1666.²⁹

By the late 18th century, traditional remedies like **fish oil** entered academic practice, formally introduced in medical literature in 1782.¹⁷

Evolution of Pharmaceutical Laboratories and Pharmacopoeia

By the late 18th century, pharmaceutical laboratories evolved from simple preparation centers into research and educational hubs, bridging pharmacy and chemistry. To overcome limitations in small-scale medicine production, pharmacists established factory laboratories for large-scale production.

- Pelletier, after discovering quinine, set up the first factory in Paris.
- Later, pharmacists like Riedel in Berlin and Zimmer in Frankfurt expanded quinine production, marking the rise of industrial pharmaceutical production, which continued into the 20th and 21st centuries.^{37,38}

The term pharmacopoeia derives from Greek: *Pharmakon* (drug) and *poiein* (to make), literally meaning "drug-making." Historically, pharmacopoeias were called Antidotarium, Dispensarium, Codex, Formularium, and Compendium until standardization in the 16th century. Pharmacopoeias define identity, quality, composition, and often have legal authority in specific regions.^{39,40}

Important 19th-century examples include:

Codex Medicamentarius Gallicus (1818, 1839, 1884)

Pharmacopoeia Londinensis (1809–1851)

United States Pharmacopoeia (1820)

Pharmacopoeia Borussica, notable for plant descriptions and use of **binary nomenclature** (e.g., *Herba Digitalis*, *Digitalis Folia*).³⁸

Coining of the Term "Pharmacognosy" and 19th–20th Century Advances

The term Pharmacognosy was first coined by C. A. Seydler (1815) in *Analecta Pharmacognostica*, marking the emergence of pharmacognosy as an independent scientific discipline. In the 19th century, pharmacognosy developed into a systematic science encompassing microscopy, phytochemical studies, and organoleptic evaluation of crude drugs.

With the advent of modern analytical techniques in the 20th century—such as TLC, HPTLC, GC-MS, LC-MS, and NMR—pharmacognosy evolved into a comprehensive science integrating botany, chemistry, pharmacology, and biotechnology.^{41,42}

3.4 Current Developments in Pharmacognosy

Pharmacognosy continues to evolve with advances in phytochemistry, molecular biology, biotechnology, and nanotechnology, expanding its applications in drug discovery and herbal medicine validation. Key modern developments include:

1. Phytochemical Research:

Isolation, characterization, and bioactivity studies of plant secondary metabolites such as alkaloids, glycosides, flavonoids, terpenoids, and polyphenols. These compounds are investigated for their pharmacological potential.^{41,42}

2. Standardization and Quality Control:

Development of pharmacopoeial standards, monographs, and quality parameters for crude drugs and herbal formulations. Techniques include TLC, HPTLC, UV-spectrophotometry, and chromatography to ensure consistency and safety.⁴³

3. DNA Barcoding and Molecular Authentication:

Use of genetic markers for precise identification of medicinal plants, preventing adulteration and substitution in herbal drugs.^{44,45}

4. Pharmacognosy and Drug Discovery:

Natural products remain a rich source for novel drug leads against diseases like cancer, malaria, diabetes, and neurodegenerative disorders.⁴⁶

5. Nano-phytopharmaceuticals:

Development of nano-formulations (nanocarriers, nanoparticles, liposomes) of phytoconstituents to enhance bioavailability, stability, and therapeutic efficacy.⁴⁷

6. Integration with Traditional Medicine:

Scientific validation of **traditional knowledge systems** such as Unani, Ayurveda, and Siddha through pharmacognostic, phytochemical, and pharmacological studies.⁴³

3.5 Scope of Pharmacognosy:

Pharmacognosy offers wide-ranging applications in research, industry, and healthcare, including:

1. Identification and Authentication of Crude Drugs:

Organoleptic, microscopic, and chemical evaluation to ensure purity and correct botanical identity.

2. Standardization of Herbal Drugs:

Preparation of official monographs for compendia such as the Unani Pharmacopoeia of India (UPI).

3. Phytochemical Research and Drug Development:

Isolation of active principles and development of plant-based pharmaceuticals.

4. Pharmacovigilance of Herbal Medicines:

Monitoring safety, adverse effects, and toxicological profiles of herbal products.

5. Conservation of Medicinal Plants:

Sustainable utilization, cultivation, and in-situ/ex-situ conservation strategies for endangered species.

6. Academic and Industrial Applications:

Careers in teaching, research institutions, herbal drug industries, and regulatory bodies.

7. Global Acceptance and Market Expansion:

Increasing demand for herbal products and nutraceuticals in global markets, creating research and industrial opportunities.

Modern Era Trends in Pharmacognosy

1. Phytochemical and Phytopharmacological Research:

Isolation and characterization of bioactive compounds, along with evaluation of their pharmacological activities.⁴⁸

2. Standardization and Quality Control:

Preparation of monographs, quality standards, and authentication using modern analytical techniques.⁴³

3. Molecular Pharmacognosy:

Application of DNA barcoding and molecular markers for plant identification and detection of adulteration.⁴⁵

4. Biotechnology in Pharmacognosy:

Use of plant tissue culture, micropropagation, and production of secondary metabolites for industrial and therapeutic purposes.⁴⁹

5. Pharmacognosy in Drug Discovery:

Exploration of natural products as a source of novel drugs for cancer, malaria, diabetes, and other chronic diseases.⁴⁶

6. Nano-phytopharmaceuticals:

Development of nanocarriers and nanoformulations to improve bioavailability and therapeutic efficacy of plant-derived compounds.⁴⁷

Discussion

The historical trajectory of *Ilmul Wasaful Aqaqeer* (Pharmacognosy) in Unani medicine demonstrates a remarkable synthesis of knowledge across civilizations and time periods. From the earliest use of plants, minerals, and animal products in Mesopotamia and Egypt, to the systematic classification and therapeutic applications in Greek and Roman medicine, the foundations of pharmacognosy were laid through empirical observation, documentation, and experimentation. Greek physicians such as Hippocrates and Dioscorides emphasized the careful identification of medicinal plants, their preparation, and clinical application, forming principles that were later adopted and expanded by Arab scholars during the medieval period.

The Golden Age of Arabic medicine played a pivotal role in preserving, systematizing, and enriching classical pharmacological knowledge. Figures such as *Al-Razi*, *Ibn Sina*, and *Ibn al-Baitar* not only catalogued hundreds of medicinal substances but also introduced rigorous methods of preparation, standardization, and therapeutic evaluation. The integration of this knowledge into the Unani system in India further enriched its pharmacognostic literature, providing a comprehensive framework for drug identification, classification, and quality assurance.

Modern pharmacognosy builds upon these classical foundations by employing advanced analytical and molecular techniques, such as chromatography, spectroscopy, DNA barcoding, and nanotechnology, to ensure the purity, safety, and efficacy of medicinal substances. The discipline now plays a critical role in drug discovery, validation of traditional medicines, and standardization of herbal formulations. Furthermore, the conservation of medicinal plants and the sustainable utilization of natural resources have become integral to the contemporary practice of pharmacognosy, reflecting an ethical dimension in line with traditional Unani principles.

The enduring relevance of *Ilmul Wasaful Aqaqeer* lies in its ability to bridge historical knowledge with modern scientific methodologies, providing a valuable interface between traditional medicine and contemporary pharmaceutical research. By understanding the historical evolution of pharmacognosy in the Unani context, researchers and practitioners can better appreciate the depth of classical wisdom and its contribution to modern therapeutic innovations.

Conclusion

The history of *Ilmul Wasaful Aqaqeer in Unani medicine* reflects a continuous process of observation, documentation, and scientific refinement that spans multiple civilizations and centuries. From the empirical practices of ancient Mesopotamia and Egypt to the systematic classifications of Greek, Roman, and Arabic scholars, and the synthesis within Indian Unani traditions, pharmacognosy has evolved into a comprehensive scientific discipline.

Today, the integration of modern analytical techniques, molecular biology, and nanotechnology continues to enhance the scope and applications of pharmacognosy, bridging the gap between traditional knowledge and contemporary medicine. The study of *Ilmul Wasaful Aqaqeer* not only preserves the rich heritage of Unani medicine but also provides a foundation for the discovery of novel therapeutic agents, standardization of herbal drugs, and sustainable utilization of medicinal plants. Recognizing its historical and scientific significance reinforces the enduring relevance of pharmacognosy as a vital field in both traditional and modern healthcare systems.

Conflict of Interest: The authors declare no potential conflict of interest concerning the contents, authorship, and/or publication of this article.

Author Contributions: All authors have equal contributions to the preparation of the manuscript and to its compilation.

Source of Support: Nil

Funding: The authors declared that this study has received no financial support.

Informed Consent Statement: Not applicable.

Ethical approval: Not applicable

References

- Evans WC. *Trease and Evans Pharmacognosy*. 16th ed. Elsevier Health Sciences; 2009.
- American Society of Pharmacognosy. *Definition of Pharmacognosy* [Internet]. 2008 [cited 2025]. Available from: <https://www.pharmacognosy.us/>
- European Scientific Cooperative on Phytotherapy (ESCOP). *ESCOP Monographs on the Medicinal Uses of Plant Drugs*. Exeter: ESCOP; 2003.
- World Health Organization (WHO). *Quality Control Methods for Medicinal Plant Materials*. Geneva: WHO; 1998.
- Seydler ECA. *Analecta Pharmacognostica*. Leipzig: G. Reimer; 1815.
- Evans WC. *Trease and Evans Pharmacognosy*. 16th ed. Elsevier Health Sciences; 2009.
- Farnsworth NR. Ethnopharmacology and drug discovery. *J Ethnopharmacol*. 1994;41(1-2):1-15.
- Heinrich M, Barnes J, Gibbons S, Williamson E. *Fundamentals of Pharmacognosy and Phytotherapy*. 4th ed. Elsevier; 2022.
- Foster S, Hobbs C. *Western Medicinal Plants and Herbs*. New York: Houghton Mifflin; 2002.
- Grigson G. *The Englishman's Flora*. London: Jonathan Cape; 1974.
- Van der Geer A, Boersma T, De Vos R. *The Ancient Environment: Human Interactions with Plants and Animals*. Leiden: Brill; 2006.
- Nutton V. *Ancient Medicine*. London: Routledge; 2004. <https://doi.org/10.4324/9780203490914>
- Breasted JH. *The Edwin Smith Surgical Papyrus*. Chicago: University of Chicago Press; 1930. <https://doi.org/10.1515/9783112615263-011>
- Li S. *Bencao Gangmu (Compendium of Materia Medica)*. China; 1596.
- Unschuld PU. *Medicine in China: A History of Ideas*. Berkeley: University of California Press; 1985.
- Sharma PV. *History of Medicine in India*. Delhi: Indian National Science Academy; 1993.
- Foster S, Hobbs C. *Western Medicinal Plants and Herbs*. Houghton Mifflin; 2002.
- Nutton V. *Ancient Medicine*. London: Routledge; 2004. <https://doi.org/10.4324/9780203490914>
- Singer C. *A History of Pharmacy*. London: Oxford University Press; 1927.
- Heinrich M, Barnes J, Gibbons S, Williamson E. *Fundamentals of Pharmacognosy and Phytotherapy*. 4th ed. Elsevier; 2022.
- Hippocrates. *Hippocratic Writings*. Lloyd GER, translator. London: Penguin Classics; 1994.
- Temkin O. *Galenism: Rise and Decline of a Medical Philosophy*. Cornell University Press; 1991.
- Dioscorides P. *De Materia Medica*. Goodyear T, translator. New York: Hafner; 2000.
- Dhanani A. *Arabic Medicine and Pharmacology: Golden Age Contributions*. New Delhi: Crescent Publishers; 2011.
- Pormann PE, Savage-Smith E. *Medieval Islamic Medicine*. Edinburgh: Edinburgh University Press; 2007. <https://doi.org/10.1515/9780748629244> PMCid:PMC1712368
- Savage-Smith E. *Medicine in the Medieval Islamic World*. Edinburgh: Edinburgh University Press; 2007.
- Nasr SH. *Science and Civilization in Islam*. Cambridge (MA): Harvard University Press; 1976.
- Singer C. *A History of Pharmacy*. London: Oxford University Press; 1927.
- Porter R. *The Greatest Benefit to Mankind: A Medical History of Humanity*. London: HarperCollins; 1997.
- Foster S, Hobbs C. *Western Medicinal Plants and Herbs*. Houghton Mifflin; 2002.
- Heinrich M, Barnes J, Gibbons S, Williamson E. *Fundamentals of Pharmacognosy and Phytotherapy*. 4th ed. Elsevier; 2022.
- Sharma PV. *History of Medicine in India*. Delhi: Indian National Science Academy; 1993.
- Dwivedi S, Dwivedi B. *History of Medicine: Sushruta-Charaka*. Delhi: Chaukhamba; 2007.
- Charaka. *Charaka Samhita*. Sharma PV, editor. Varanasi: Chowkhamba Sanskrit Series; 2010.
- Sushruta. *Sushruta Samhita*. Srikantha Murthy KR, editor. Varanasi: Chowkhamba Sanskrit Series; 2009.
- Foster S, Hobbs C. *Western Medicinal Plants and Herbs*. Houghton Mifflin; 2002.
- Cox PA. *Willows, Oaks, and Cinchona: The History of Malaria and Quinine*. London: Harvard University Press; 2002.
- Sneader W. *Drug Discovery: A History*. Chichester: Wiley; 2005. <https://doi.org/10.1002/0470015535>
- Urdang GE. *Pharmacopoeias: Past and Present*. London: Heinemann; 1950.
- Vulpius G. *Die Pharmakopöe und ihre Bedeutung*. Leipzig: F.C.W. Vogel; 1890.
- Evans WC. *Trease and Evans Pharmacognosy*. 16th ed. Elsevier Health Sciences; 2009.
- Heinrich M, Barnes J, Gibbons S, Williamson E. *Fundamentals of Pharmacognosy and Phytotherapy*. 4th ed. Elsevier; 2022.
- Mukherjee PK. *Quality Control and Evaluation of Herbal Drugs: Pharmacognosy, Phytochemistry and Biotechnology*. 3rd ed. Elsevier; 2019. <https://doi.org/10.1016/B978-0-12-813374-3.00016-8> PMCid:PMC7149824
- Chen S, Yao H, Han J, Liu C, Song J, Shi L, et al. Validation of the ITS2 region as a novel DNA barcode for identifying medicinal plant species. *PLoS One*. 2014;9(4):e86154.

45. Tehen N, Parveen I, Pan Z, Khan IA. DNA barcoding of medicinal plant material for identification. *Curr Opin Biotechnol.* 2014;25:103–110. <https://doi.org/10.1016/j.copbio.2013.09.010> PMID:24484887
46. Newman DJ, Cragg GM. Natural products as sources of new drugs over the nearly four decades from 01/1981 to 09/2019. *J Nat Prod.* 2020;83(3):770–803. <https://doi.org/10.1021/acs.jnatprod.9b01285> PMID:32162523
47. Patra JK, Das G, Fraceto LF, Campos EV, Rodriguez-Torres MdP, Acosta-Torres LS, et al. Nano-based drug delivery systems: recent developments and future prospects. *J Nanobiotechnol.* 2018;16(1):71. <https://doi.org/10.1186/s12951-018-0392-8> PMID:30231877 PMCID:PMC6145203
48. Heinrich M, Barnes J, Gibbons S, Williamson E. *Fundamentals of Pharmacognosy and Phytotherapy.* 4th ed. Elsevier; 2022.
49. Verpoorte R, Contin A, Memelink J. Engineering the plant cell factory for secondary metabolite production. *Transgenic Res.* 2002;11(4):289–299.