



# **The Contribution of Muslim Scientists to Botany in the Middle Ages**

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The development of botany and agricultural knowledge in the early Islamic world was shaped by a unique combination of environmental necessity, intellectual curiosity, and a strong tradition of translation and synthesis. Many regions under Arab-Islamic rule, especially the heartland of Arabia and the Hijaz provinces (Makkah, Madinah, and Taif), suffered from scarcity of water, limited natural resources, and difficult terrain, which made cultivation a demanding task. The Hijaz, including Najd, is a vast arid and rocky plateau surrounded by deserts such as Nafud in the north, Ad-Dahna in the east, and Rub' al-Khali in the south. It is characterized by barren and infertile landscapes with little vegetation due to extreme dryness, poor soil quality, and harsh environmental conditions.(1) In fact, Arabia has been described as one of the “driest and hottest” regions of the world, while al-Hijaz, the cradle of Islam, frequently experienced droughts extending over several years.(2)

This natural scarcity compelled people to observe the land closely, experiment with soil and water management, and search for methods to improve cultivation. Consequently, agriculture did not remain merely a manual occupation but developed into a field of scientific investigation. Arab scholars of the medieval period carefully documented their findings and observations. Another important factor that encouraged the study of plants was the exposure of Muslim scholars, particularly during the early Abbasid period, to the scientific writings of earlier civilizations. Their interest in botanical studies gained momentum after the translation of works from Greek, Persian, and Indian languages into Arabic.(3)

## **Introduction**

When the Arabs came into contact with Greek, Persian, and Indian scientific traditions, they began translating botanical, medical, and geographical texts into Arabic.(4) These translations laid the foundation for new scientific inquiry and innovation. Muslim scholars did not merely imitate earlier authorities; rather, they added original observations, corrected previous errors, and expanded botanical knowledge through independent research. Their botanical writings thus became a synthesis of inherited wisdom and original contribution.

Bernard Lewis refers to this historical development in the following words:

“After the time of Hunayn, pharmacology rapidly developed in the eastern countries of the Muslim world. About a hundred Arabic authors on materia medica are mentioned in the bibliographical works of Ibn al-Nadim, Ibn Abi Usaybi'a, and Ibn al-Qifti. Some thirty are represented by manuscripts in Eastern and Western libraries, though only a few have been studied by Western scholars.”(5)

The Arabs were already familiar with desert plants and traditional Arabian herbs such as Aqaqir wa'l Hashaish.(6) These plants were commonly used for food, shelter, and medicine. However, as the Islamic empire expanded and medical knowledge advanced, Muslims encountered new climates, ecosystems, and varieties of vegetation. This exposure introduced them to a wide range of agricultural practices, irrigation systems, and plant-based medicines. Scholars travelling across different regions of the empire documented local herbs and agricultural methods, recording information about cultivation, harvesting, local nomenclature, and medicinal uses.(7) Thus, the study of plants and herbs developed primarily for agronomical and medical purposes.

Modern scholars have highlighted the rich yet often neglected history of botanical achievement during the Islamic Golden Age and the Ottoman period. Islamic civilization made foundational contributions to

horticulture and agricultural science. *Al-Filaha al-Nabatiyya* (The Nabataean Agriculture), an influential Arabic work by Ibn Wahshiyya, introduced innovative agronomical concepts and became one of the most significant agricultural treatises of the medieval world.

This text, along with later Andalusian works by Ibn al-Awwam and Ibn al-Baytar, documented numerous varieties of crops such as pears, grapes, and roses, while also providing advanced instructions regarding grafting, irrigation, and soil cultivation. Historical writings from the Islamic Golden Age and the Ottoman Empire reflect an extraordinary tradition of horticulture. Muslim scholars and Ottoman gardeners revolutionized the cultivation of fruits, vegetables, and flowers through selective breeding, cross-pollination, and sophisticated grafting techniques.(8)

The extent of Muslim achievements in applied botany and agronomy may be understood through the study of gardens, crop cultivation, and medicinal plants across different parts of the Islamic world, especially in al-Andalus (Muslim Spain) under the Umayyads and in the Abbasid Caliphate. It is important to note that “at one time Muslim Spain was proverbial in this respect.” In Andalusia, Muslims introduced new agronomical tools and scientific agricultural methods. Most significantly, they pioneered experimental botanical studies through the establishment of botanical gardens.(9)

This environment enabled Muslim botanists to compile works far more comprehensive than any previously available. Among the earliest contributors to botanical science were ‘Abd al-Malik al-Asma‘i (c. 740–828), Jabir ibn Hayyan, Ibn Wahshiyya, Abu Ja‘far al-Ghafari (d. c. 1165), Ibn Bajja (1085–1138), Ibn al-Baytar (1197–1248), Abu al-Abbas al-Nabati (d. 1239), Rashid al-Din al-Suri (1177–1241), and several others.

#### Distinctive Achievements

Muslim agriculturalists and agronomists from both the eastern and western Islamic world produced significant research on farming techniques, agricultural tools, and irrigation systems. Their writings covered the cultivation of fruits, vegetables, flowers, and herbs, as well as plantation management, animal husbandry, fertilization methods, and climatic conditions necessary for specific crops.

Arab-Islamic scholars contributed to both pure and applied botany, just as they excelled in chemistry, mathematics, and astronomy. P. K. Hitti explains the importance of their botanical studies:

“In the field of natural history...the Western Muslims enriched the world by their researches. They made observations on sexual differences between such plants as palms and hemp. They classified plants into those that grow from cuttings, those that grow from seed, and those that grow spontaneously.”(10)

A ninth-century text, *Nuzhat al-Anam fi Mahasin al-Sham*, along with *Al-Filaha al-Nabatiyya*, contains specialized discussions of Syrian pears and documents twenty-one varieties of pears, fifty varieties of grapes, and six varieties of roses. Ottoman gardeners later produced 839 varieties of tulips and became highly skilled in grafting techniques.(11)

Ottoman floriculture reached its peak during the reign of Suleiman the Magnificent, marking a major cultural renaissance. More than two hundred flower shops reportedly existed in sixteenth-century Istanbul, demonstrating the social importance of floriculture. Tulips, roses, and carnations were among the most valued flowers cultivated in Ottoman gardens.(12)

Arab-Muslim botanists were also familiar with methods for producing new fruits and flowers. During the Abbasid and Umayyad periods, they successfully developed new varieties through grafting techniques. Experiments were even conducted by combining rose bushes with almond branches to produce new ornamental flowers.(13)

Muslim scholars, particularly in Spain, established new standards in agricultural science, often supported by detailed legal regulations.(14) They paid attention not only to crop cultivation but also to irrigation, cattle

breeding, plant diseases, poultry farming, beekeeping, and animal husbandry. John William Draper writes regarding their contribution:

“To them we owe the introduction of great products—rice, sugar, cotton—and nearly all the fine garden and orchard fruits, together with many less important plants, such as spinach and saffron.”(15)

The agricultural system adopted in al-Andalus relied upon sophisticated irrigation methods and scientific principles introduced by Arabs and Moors from Syria, the Middle East, and North Africa. They implemented advanced crop rotation techniques, enabling year-round agricultural production. A wide variety of plants, including cotton, mulberry, date palms, pistachios, bananas, and numerous fruits and vegetables, were successfully cultivated.(16).

#### The Prominent Arab Botanists and Agronomists:

##### Ibn Wahshiyya.

The Iraqi scholar Ibn Wahshiyya translated and authored important works on agriculture and botany. His famous *Al-Filaha al-Nabatiyya* (The Nabataean Agriculture) contains detailed discussions on soil types, irrigation, fertilizers, and methods of improving crop yield. This work inspired later agricultural writers and became one of the foundational texts of medieval agronomy.

##### Ibn al-Baytar

Ibn al-Baytar is among the most celebrated botanists and pharmacologists of the Middle Ages. Born in Málaga, he studied in Seville and later became an authoritative herbalist in Egypt and Syria. Through extensive travels and careful observation, he significantly expanded scientific knowledge regarding medicinal plants.

Among his most important works are *Al-Mughni fi al-Adwiya al-Mufrada* and *Al-Jami' li-Mufradat al-Adwiya wa al-Aghdhiya*. His writings compiled the botanical and pharmacological knowledge available during his time, drawing upon sources ranging from Dioscorides to his teacher Abu al-Abbas al-Nabati.

His encyclopedic *Al-Jami'* contains 2,324 entries describing approximately 1,400 plants and medicinal substances, nearly four hundred of which were previously unknown to Greek science.(18) According to Will Durant, Ibn al-Baytar's work represented the culmination of “Islamic botany” and remained the standard botanical authority until the sixteenth century.(19)

##### Abu Hanifa al-Dinawari

Abu Hanifa al-Dinawari occupies a distinguished place in the history of Islamic botany. His celebrated *Book of Plants* is regarded as one of the earliest scientific works devoted entirely to botany in Arabic. Unlike many earlier writers, al-Dinawari relied heavily upon direct observation. He described hundreds of plant species, their characteristics, growth patterns, and practical uses. He also examined the effects of soil and climate on vegetation.(21)

##### Al-Biruni

Al-Biruni made important contributions to pharmacology and medicinal botany. Deeply interested in plant-based medicine, he authored significant works describing the properties and uses of medicinal herbs and drugs.

He carefully identified plants in different languages in order to avoid confusion among physicians and pharmacists.(22).

#### Ibn Sina

Avicenna, known in the Islamic world as Ibn Sina, also contributed enormously to botany through his famous Canon of Medicine. Although primarily a medical encyclopedia, the work contains extensive discussions on medicinal plants and herbal preparations. Ibn Sina explained the effects of herbs on the human body and described methods for preparing plant-based medicines.(23)

#### Ibn al-Awwam

One of the greatest agronomists of Muslim Spain was Ibn al-Awwam. His monumental agricultural treatise, Kitab al-Filaha, is regarded as one of the finest medieval works on agriculture. The book covers soil classification, irrigation systems, planting schedules, grafting techniques, preservation of crops, and livestock management.(24)

Al Awwam is considered the last famous scholar of botany and agricultural science in Spain, His great work on this subject is entitled - Kitab al- Falaha , in fact, Ibn Al Awwam work is based on the works of Arab and non Arab predecessors, however this important book also contains the author's personal observations and experiments.(25)

The Muslim tradition of scientific travel also played a significant role in the expansion of agricultural knowledge. Scholars travelled widely to study local farming practices, irrigation methods, fertilizers, and exotic crops. Their observations contributed to the spread of improved agricultural techniques across the Islamic empire.

In addition to large encyclopedic works, Muslim scholars composed shorter treatises on subjects such as date-palm cultivation, perfumes derived from flowers, and plant-based dyes. These writings reveal that botany in the Islamic world encompassed agriculture, medicine, industry, and commerce.

The remarkable progress of botanical science in the Islamic world was supported by libraries, hospitals, and botanical gardens. Many hospitals maintained gardens where medicinal plants were cultivated and studied. These gardens functioned as living laboratories where scholars and students learned to identify herbs, prepare remedies, and observe plant growth under controlled conditions.

Greek works such as those of Dioscorides continued to influence Muslim scholars, but Islamic scientists expanded and corrected them through their own observations. Arabic translations and commentaries enriched these texts with illustrations and additional information, eventually making them standard references for centuries in both the Islamic and European worlds.

By the twelfth century, Arabic botanical and agricultural literature had become so extensive that later scholars compiled encyclopedic summaries of earlier research. Writers such as Al-Qazwini and Al-Idrisi included valuable information about plants and regional vegetation in their works.

The significance of Muslim contributions to botany and agriculture becomes evident when one considers their long-lasting influence on Europe and the wider world. Their agricultural manuals inspired reforms during the Renaissance, while their pharmacological studies shaped medical science for centuries. Their observations regarding climate, soil, irrigation, and crop cycles also laid important foundations for modern environmental and agricultural studies.

Thus, the development of botany in the Islamic world was not the achievement of a single scholar or region. It emerged through the combined efforts of physicians, travellers, agronomists, and philosophers who regarded the study of nature as both a practical necessity and an intellectual pursuit. Their careful observation, experimental spirit, and openness to knowledge from diverse cultures created one of the richest scientific traditions of the medieval world.

of remarkable richness.

#### References

- (1). P.K. Hitti, History of the Arab, Palgrave, Macmillan, Te, 10,th Edition,2002: 15-17
- (2). PK Hitti: 19
- (3). Al Qifti, Ali Ibn Yusuf, Tarikhul Hukama, Leipzig,1930,p: 80, 413.
- (4). Lewis, The World Of Islam, Thomas and Hudson pub, Bernard, (Editor) London, 1976, p: 181.
- (5) Muhammad Saud, Islam and Evolution of Science, Islamic Research Institute, Islamabad, 1986,p: 118.
- (6). Ibid: 118
- (7). Reuben Levy, Social Structure of Islam, 1957: 492-494 . Quroon-e- Wusta ke Musalmanon Saenci Karnaane, Markazi Maktaba Islamic Publishers,1999, p:73-74
- (8). The Ottoman's Flowers: Flowers as a Symbol of Civilization" by Elif Özdemir, Bogazici University Academia.edu., (unpublished working paper or research documents hosted by this institution) p: 3-4
- (9). Will Durant , The Age of Faith. P: 329-330. PK Hitti, History of The Arabs,p: 574
- (10). Hitti, The History of the Arabs:p 575
- (11). Ghulam Qadir Lone, Quroon-e- Wusta ke Musalmanon Saenci Karnaane, p: 80
- (12). Elif Özdemir,p: 30-40
- (13). Will Durant, The Age of Faith,New York,1985,p: 245.
- Hitti, History of the Arabs,p: 574.
- (14). History of the intellectual development of Europe, Draper, John William, London, 1891,p: 2/45
- (15). Ibid: 2/45-46
- (16). Aal-e-Qutub Aal-e-Syed Abdullah Shah Ghazi, Agriculture in Muslim civilisation A Green Revolution in Pre-Modern Times.March 24, 2019. aal-e-qutub.com
- (17) Hitti History of The Arabs, P: 575
- (18) Hitti History of The Arabs, P: 575
- B Lewis, Arabs in History Goodword Book, New Delhi. Hitti: 575
- (19) Will Durant, The Age of Faith,p: 329
- (20) Ibid: 329-330
- (21). Muhammad Saud, Islam and Evolution of Science, p: 120
- (22). Muhammad Saud, p: 120

(23). Ibid: 120-121

(24). Hitti, History of The Arabs,p: 575

(25). Al Baghdadi, Ismail Pasha al Baghdadi, Hidayatul Arifin, Istanbul, 1951,p: 223-224

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