Plants of Healing: The lasting impact of Arab contributions to herbal medicine

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Research

Abstract

Background: The Arab world has historically served as a major center for the collection, documentation, and application of traditional medicinal practices. During the Islamic Golden Age, Arabian scholars not only preserved Greco-Roman medicinal knowledge but also advanced herbal medicine through empirical investigations and the synthesis of diverse cultural practices. Here, we appraised the enduring contributions of Arabian herbal medicine from the Islamic Golden Age to modern pharmacology, with particular attention to specific medicinal plants and their documented therapeutic applications across various diseases.

Methods: This review employed a historical-analytical method, sourcing classical texts, peer-reviewed scientific literature, and ethnobotanical surveys to identify influential Arab scholars, medicinal plant usage, and their ethnopharmacological relevance. Medicinal plants discussed were selected based on documentation in Arab literature and modern pharmacological studies.

Results: Arab scholars such as Avicenna, Al-Razi, and Ibn Al-Baytar made pioneering contributions to pharmacology, distinguishing it from general medicine. Over 1400 plant species were documented in Arab pharmacopoeias, many of which have shown efficacy in managing diabetes, hypertension, liver and kidney disorders, skin conditions, and neurological diseases. Their traditional use correlates with contemporary pharmacological findings, substantiating their therapeutic values.

Conclusions: Arab contributions to herbal medicine were foundational in the development of systematic pharmacology and influenced both Eastern and Western medical traditions. Recognizing and preserving this knowledge is essential for its integration into modern healthcare and for guiding future drug discovery and development, particularly through interdisciplinary approaches leveraging traditional wisdom and modern technology.

Keywords: Arabians; Diseases; Medicinal plants; Modern pharmacology; Phytotherapy; Traditional practices

Background

The contribution of Arabs to herbal medicine remains a significant foundation in historic and contemporary healing practices. Generally, plants provide basic needs such as food, shelter, transportation, fragrance, organic manures and medicine for humans (Dar *et al.* 2017). Also, economic sectors, especially cosmetic, beverage, organic fertilizer, paper and matches making and pharmaceutical industries, utilize plants as their major raw materials. Notably, medicinal plants play pivotal roles in herbal medicine because of their phytochemicals with characteristic healing and curative properties that can excite pharmacological actions (Ullah *et al.* 2014). While extracts from medicinal plants are taken as powder, infusions, syrups, ointments or herbal teas (Saad *et al.* 2005), their phytochemicals such as alkaloids, flavonoids, steroids, saponins, terpenoids, cardiac glycosides, reducing sugars, phlobatannins, phenolics, polysterols, coumarins, quinones, anthocyanin, resins, anthraquinones and other bioactive secondary metabolites are ethnopharmacologically beneficial as antibiotics, anti-inflammatory, anticancer, antioxidant, antispasmodic, antiulcer and antiallergic therapeutics (Ghasemzadeh *et al.* 2010; Agidew 2022; Rabizadeh *et al.* 2022).

Herbal medicine is a global phenomenon with diverse knowledge and practice, with about 50% of many industrialized countries adopting its use as traditional, complementary and integrative medicine (WHO 2023). The practice of herbal medicine is widespread in the middle-east countries such as Palestine, Iran, Iraq, Saudi Arabia, Bahrain, Lebanon, and Syria among others. In China alone, approximately 40% of the total medicinal consumption is ascribed to herbal medicine (Dar *et al.* 2017). Moreover, the Arabian nations and homelands was the center of science and medicine after the collapse of Roman Empire and all the manuscripts were translated into Arabic language (Azaizeh *et al.* 2006). In Saudi Arabia, herbal medicine is not alien. Herbalists and religious leaders are the complementary alternative healers that are mostly consulted (Musaiger and Abahussain 2015). This was further substantiated in a study where 70% of the respondents were knowledgeable about herbal medicine and 88% confirmed the use of this age-long traditional practice (Al Akeel *et al.* 2018). Furthermore, about 49% of Saudi women were reported to rely on herbal medications after delivery while 34% used it during labour (Al-Ghamdi *et al.* 2017).

Interestingly, the traditional care system in Iraq also centered on herbal medicines where plants with curative and therapeutic properties are used to treat human diseases, but the practice is gradually fading away due to lack of proper documentation (Al-douri 2010). The Persians or Iranians have long embraced the use of medicinal plants and vegetal extracts to manage, prevent, diagnose and cure diseases in nation's territory (Buso *et al.* 2020). In fact, Traditional Iranian Medicine (TIM) endorsed certain plants and herb preparations for preclusion or treatment of diseases associated with dysfunctions of the central nervous system (CNS) such as epilepsy, stroke, amnesia, dementia, Alzheimer's disease and Parkinson (Shojaii *et al.* 2016). Civilization of Egyptians is not limited to pyramids and tombs, but it touches human health in terms of herbal medicine. They were accustomed to plant-based drug preparation using plants such as aloe, castor, cumin, safflower and caraway (Aboelsoud 2010). Cloves, garlic, thyme, cannabis, onions are commonly used in Egyptian medicines and wines are amended with herbs in oral medicines (McGovern *et al.* 2009; Aboelsoud 2010). Similarly, majority of Moroccans use traditional medicine to treat diseases because herbal medicine has been an inseparable entity from their tradition and culture (Chaachouay *et al.* 2022). According to Fennene and Ibn Tattou (2012), about 600 species of plants are medicinal out of more than 900 endemic plants. Due to this feat, Morocco has been recognized as one of the leading exporters of medicinal plants and traditionalists to countries using plants to cure deadly diseases including cancer (El Fakir *et al.* 2019).

Among the Arabs, herbal healing system is an important component of their cultural heritage that places emphasis on the use of medicinal plants to cure and manage human diseases. The use of therapeutic plants is traditionally integrated into the cultural fabric of the Arabs and several notable works had been done on the use of Arabian medicinal plants (McGovern *et al.* 2009; Aboelsoud 2010; Al-douri 2010; Musaiger and Abahussain 2015; Shojaii *et al.* 2016; Al-Ghamdi *et al.* 2017; Al Akeel *et al.* 2018; El Fakir *et al.* 2019; Buso *et al.* 2020; Chaachouay *et al.* 2022), but a more concise appraisal is imperative to give a general overview on the most relevant and significant studies. It is equally necessary to bring into the spotlight how Arabian herbal healing system influences modern medicine especially in the field of pharmacology, pharmacognosy, botany and ethnomedicine. Hence, this paper appraised pertinent information on the contributions of the Arabs to herbal medicine and identified common and significant medicinal plants that are therapeutically important to the Arabian regions. This is hoped to complement the existing information on herbal medicine in these regions and address part of the growing global concern in complementary and alternative medicine.

Materials and Methods

This review employed a historical-analytical methodology to explore the legacy of Arab scholars and the ethnopharmacological relevance of medicinal plants. Materials were sourced from standard manuscripts and historical texts**,** which gave an insight into early scholarly contributions. Peer-reviewed scientific literature**s** were accessed primarily through databases such as PubMed, Scopus, and Google Scholar, to scrutinize modern pharmacological validation.

The selection of medicinal plants for discussion was guided by plants that were explicitly documented in classical Arab medical literature and plants that had been used in modern pharmacological or phytochemical investigations. However, studies were excluded if they lacked sufficient ethnobotanical or pharmacological evidence, or if they duplicated information without providing novel insights. Data from the sources were analyzed to identify major Arab scholars, their origins and contributions to medicinal plant knowledge, and the continuity of such knowledge in contemporary research**.** Emphasis was placed on the uses of the medicinal plants to cure and manage diseases among the Arabs.

Results

Historical Background of Arabian Herbal Medicine

Herbal medicine in the Arab world has a rich legacy, rooted in the Golden Age of Arab-Islamic civilization (7th–14th centuries AD), during which scholars made transformative contributions by integrating and expanding upon ancient Greek and Roman medicinal knowledge. The translation movement of this era was instrumental in preserving these classical texts, fostering a robust scientific foundation that catalyzed advancements in botanical and medical sciences (Montazeri and Sepehri 2019). This synthesis of knowledge led to sophisticated herbal practices that have endured and evolved, deeply influencing contemporary medical traditions (Drogosis *et al.* 2022).

Arab physicians were among the first to systematically adopt Greek medicinal practices, introducing novel herbal treatments and techniques, including the application of surgical and non-invasive remedies for several ailments. These practices were encapsulated in some of the first botanical encyclopaedias during the 6th and 7th centuries AH, detailing medicinal plants and their applications, which significantly advanced botanical science in the Arab world (Montazeri and Sepehri 2019). Central to these treatments were herbs from diverse plants, including *Allium sativum, A. cepa, onion, Nigella sativa, Punica granatum, Olea europaea* and *Triticum aestivum* —each used for their therapeutic properties. Avicenna, a leading physician of the era, recommended the herb Hindiba (chicory) for cancer treatment, especially in cases involving urinary tract malignancies (Drogosis *et al.* 2022).

The Islamic Golden Age, often called the "Age of the Khalifs," marked an era of remarkable achievements in medicine, particularly in pathology and surgery (Drogosis *et al.* 2022). Building on Hellenic, Persian, and Indian medical knowledge, Arab physicians introduced advanced methods of diagnosis and treatment, including the revolutionary distinction of pharmacology from medicine. This milestone was spearheaded by the Assyrian physician, Yuhanna ibn Masawayh (777–857 AD), who pioneered herbal therapeutics, aromatherapy, and concepts of immunity, laying critical groundwork for pharmacological research (Drogosis *et al.* 2022). Further advancements were made by Abu al-Hasan Ali ibn Sahl Rabban al-Tabari (808–870 AD), who emphasized personalized medicinal preparations, anticipating modern approaches to customized healthcare (Drogosis *et al.* 2022).

Al-Razi (865–925 AD), also known as Rhazes, was another prominent physician whose encyclopaedic work, Al-Hawi fi al-tibb, compiled 900 case studies, with an emphasis on folk medicine. Translated into Latin in the 13th century, this text had a profound influence on European medicine, especially with its documentation of medicinal plants such as *Allium sativum, A. cepa, Nigella sativa* and *Punica granatum*—plants whose herbs are still valued today for their therapeutic effects (Amer and Mohammad 2022).

Al-Zahrawi (936–1013 AD), known in the West as Albucasis, made pivotal contributions to surgery and herbal medicine through his 30-volume compendium, Kitab al-Tasrif. His meticulous differentiation of acute kidney inflammation from kidney cancer marked a milestone in diagnostic accuracy. Albucasis's influence extended to surgical practices, where he integrated herbal remedies, such as garlic and onion, to alleviate symptoms of various ailments, including cancer (Drogosis *et al.* 2022). Ibn Sina (980–1037 AD), or Avicenna, authored 'The Canon of Medicine', a seminal work that remained a medical reference in European universities until the 17th century. In The Treatise on Cardiac Drugs, Avicenna explored heart diseases and the effects of psychological stress on cardiac health. Notably, he advocated early radical excision of diseased tissues, identifying

Hindiba as a beneficial herb for cancer treatment, and highlighted the role of dietary choices in health maintenance (Yousefsani *et al.* 2021; Drogosis *et al.* 2022).

Ibn al-Baytar (1197-1248 AD) was a prominent 13th-century Andalusian scholar known for his significant contributions to the fields of botany and pharmacology. His most renowned work, "Kitab al-Jami li-Mufradat al-Adwiya wa-l-Agdiya," is a comprehensive compendium of medicinal plants and foods, organized alphabetically (Derakhshan *et al.* 2020). This work is highly valued for its detailed descriptions and the extensive use of various sources, reflecting the rich botanical knowledge of the Islamic Golden Age.

Ibn Nafis (1213–1288 AD) was another influential figure in the Arab-Islamic medical tradition. He is best known for his discovery of the pulmonary circulation of blood, but he also contributed to the field of herbal medicine. His works often referenced the use of herbal treatments to restore the body's homeostasis and correct abnormal temperaments, a concept central to the Unani system of medicine (Saudagar *et al.* 2020). By the 16th century, Hakim Muamin's Tohfat al-Muaminin, a comprehensive pharmacopoeia, provided an invaluable reference for traditional herbal treatments, solidifying the significance of folk medicine in the Arab world (Amer and Mohammad 2022). Table 1 highlights some of the notable Arabs that made significant contributions to the field of herbal medicine.

Table 1. Some remarkable contributors to herbal medicines in Arabian countries

S/No	Name	Country	Year	Contribution	Reference
1	Abd al-Rahman ibn Muhammad ibn al-Ash'ath (Al-Ash'ath)	Iraq	d. 704	In his books*, Quwa al-Adwiyyah and Al-Ghadhi wal-Mughtadhi,* he elucidated various properties of mineral, animal and plant-based medicine	(Saad and Said 2011)
2	Abu Musa Jabir Ibn Hayyan (Al-Azdi)	Iran	721-515	He was known as the father of Arab Chemistry and among the founders of modern pharmacy	(Amr and Tbakhi 2007)
3	Yuhann ibn Masawayh	Iraq	777-857	He worked on hygiene, drugs and diets. He used medicinal herbs and recommended them as immune enhancers.	(Masic *et al.* 2017)
4	Abu Yusuf Ya'Qub ibn Ishaq al-Sabbah al-Kindi (Alkindus)	Iraq	801-873CE	He was the first scientist that developed pharmacological techniques	(Demirhan 2018)
5	Hunayn ibn Ishaq al-Ibadi (Johannitius)	Iraq	809–873 CE	He translated Greek works on herbal medicine (such as Dioskorides' book on drugs "*De Materia Medica*") into Arabic. This provided the headway for the development of herbal medicine in Arabian world	(Masic *et al.* 2017)
6	Abu Hanifah Ahmad ibn Daud al Dinawari	Iran (erstwhile Persia)	815-895/902	He authored *Kitab al-nabat* (Book of Plants), where wrote on Arabic botanical traditions	(Bonner 2024)
7	Abu Bakr Muhammad ibn Wahshiyya al-Nabati	Iraq	d. 930	He authored *Kitab al-Filaha al-Nabatiyya* where the details on cultivation uses of medicinal plants were enshrined.	(Rashed 2021)
8	Abu Bakr Al-Razi (Rhazes)	Iran	865-925 CE	He wrote *Kitab al-Hawi* (a medical encyclopaedia that gave a systematic classification of diseases and recommends the use of herbs	(Pormann and Savage-Smith 2007)

9	Abu Jafar Ahmad Ibn Ibrahim Ibn abi Khalid Ibn al-Jazzar (A**lgizar)**	Tunisia	**898–980**	He was the first muslim physician that contributed to medical sciences in North Africa	(Taghizadieh *et al.* 2020)
10	Abu Al Qasim Al Zahrawi (Albucasis)	Spain (Al-Andalus)	936–1013	He was the father of the modern surgery. He contributed to herbal medicine in *Kitab-al-Tasrif*	(Amr and Tbakhi 2007)
11	Abu Rayhan Muhammad ibn Ahmad Al-Biruni	Uzbekistan	973-1050	He documented more than 800 botanicals with their therapeutical uses in his book named *Kitab al-Saydalah* (The Book of Pharmacy)	(Roohnavaz *et al.* 2022)
12	Abu Ali al-Husayn ibn Abd Allah ibn Sina (Avicenna)	Afghanistan	980-1037	He authored The Canon of Medicine (the book that gave details on pharmacological potentials of plants with their therapeutic properties	(Nasser *et al.* 2009)
13	Ali ibn al-'Abbas *al-Majusi (Masoudi or Haly Abbas)*	Iran	d. 983	He was the author of *Kitab-al-Maliki* (a book of medical art that classified drugs and provided information on herbal preparations)	(Belen and Aciduman 2006)
14	Ali Ibn Ridwan	Egypt	988-1061 CE	He revealed in *Kitab al-Kafi fi al-Tibb* the herbal remedies and prevention of many diseases	(Pormann and Savage-Smith 2007)
15	Amīn al-Dawla Abu'l-Ḥasan Hibat Allāh ibn Ṣaʿid ibn al-Tilmīdh	Iraq	1074-1165 CE	He was an Arabian Pharmacologist that published *Fi Tadbir al-Sihha* providing guidance on the use of medicinal plants	(Käs 2023)
16	Abu Marwan Abd al-Malik ibn Zuhr (Avenzoar)	Syria	1094-1162	He was a physician treating people with the combination of herbs and physical and mental practices. He mentioned 230 medications that are mostly plant-based in *Al Kitab Al Jami.*	(Shahpesandy *et al.* 2022)
17	Al-Zubayr *ibn al-Awwam*	Spain (Al-Andalus)	d. 1158	He explained cultivation of medicinal plants in *Kitab al-Filaha*	(Digard 1985)
18	Rabbi Moses bin Maimon (Maimonoides)	Spain, Egypt	1138-1204	He documented medicinal herbs in a book and manual containing synonyms for the drug names	(Masic *et al.* 2017)
19	Ibn al-Baytar	Spain (erstwhile Andalusia)	1197-1248	In his pharmacopoeia, *Kitab al-Jami fi al-Adwiya al-Mufrada*, he itemized more than 1400 plants with their uses in medicine	(Vernet 2008)
20	Ibn Abu Usaybi'a	Palestine (Jerusalem and Damascus)	1203-1270	He documented medicinal plants and their properties in *Uyun al-Anbaʾ fī Iabaqat al-Aṭibba*	(Nagamia 2007)
21	Shams ad-Dīn adh-Dhahabī	Syria	1274-1348	An Islamic scholar that incorporated herbal medicine into physical and spiritual treatments	(Yusoff and Razak 2019)

22	Muhammad ibn Abd Allah ibn Said ibn Ali ibn Ahmad al-Salmani (Ibn al-Khatib)	Spain	1313-1374 CE	He elucidated the properties of medicinal plants native to North Africa in *Kitab al-Aqiba*. The plants that were using in preventing epidemic during Black Death	(Pormann and Savage-Smith 2007)
23	Abu ʿAbd Allah Muḥammad ibn ʿAbd Allah al-Lawati al-Ṭanji ibn Baṭṭūṭah	Morocco	1304-1369	He documented numerous medicinal plants during his expedition, and this provides insights into exchange of knowledge related to medicinal plants	(Dunn 2020)
24	Al-Hassan Ibn Mohammed Al-Wazzan (Leo Africanus)	Spain and Morocco	1485-1554 CE	He wrote (in *Descrittione dell'Africa*) on the use of medicinal plants obtainable around North African countries	(Brittanica 2024)
25	Alāʾ ad-Dīn Abū al-ʿAlāʾ ʿAlī ibn Abī al-Ḥaram al-Qurayshī (Ibn al-Nafis)	Syria	1213-1288	In his *Al-Shamil fi al-Tibb*, he detailed the description of medicinal plants and their uses for respiratory and skin diseases.	(Pormann and Savage-Smith 2007)
26	Dawud Al-Antaki (David of Antioch)	Antakya (Northern Syria and Southern Turkey	1543-1599	In one of his books, *Tadhkirah, he explained herbal medicine and occult sciences*	(Lev 2006)
27	Hakim Muhammad Said	Pakistan	1920-1998	He was founder of Hamdard Foundation. He documented many herbs to cure diseases and did extensive research on herbal medicines	(Said 1996)

Specific Herbs Used by Arab Herbalists

Arabians have made a very indelible contribution to the field of medicine by exploring and documenting plants with therapeutic properties. This was possible due to their comprehensive and impressive traditional knowledge on using medicinal plants to treat or manage diseases (Azaizeh *et al.* 2010). While phytotherapy remains an age-long practice in many cultures, the contributions of Arabs such as Ibn Sina (Avicena in the West) in the form of *Al-Qanun-fil-Tib* (Canon of Medicine) remain remarkable in the history of medicine. In additions, Arabian herbalists from Baghdad and Iraq took the lead to separate medicine from pharmacology by working on extractions and preparations of curative substances. While Abu Musa Jabir Ibn Hayyan Al-Azdi and his co-researchers extracted certain compounds from plants with anesthetizing properties, Ibn Al-Bitar, from Andalus, identified about 350 herbs for the treatment of human diseases. In addition to highlighting some of the key medicinal plants finding therapeutic relevance among the Arabs below, Table 2 also summarizes some of the commonly used ones to cure, manage or treat human diseases.

Diabetes

Diabetes is a metabolic disorder characterized by high blood sugar that resulted from dysfunctionalities in insulin secretion. It is one of the global health challenges and Arabs are traditionally known to use medicinal plants to address this endocrine disease. *Ajuga iva* is a plant from the family Lamiaceae with antidiabetic properties. The aqueous extract from the leaves causes hypoglycemia and the activity is attributable to presence of flavonoids that improve insulin production and thwart *β*-cell apoptosis (Boudjelal *et al.* 2015; Abu-Odeh and Talib 2021). Moroccans and Libyans incorporated the plant into their folk medicine to treat many diseases including diabetes (Saidi *et al.* 2023; Abomughaid *et al.* 2024). In Saudi Arabia, *Avicennia marina* from the family Avicenniaceae is used in the treatment of many diseases including diabetes. This property of the plant is attributed to its saponin contents which stimulate *β*-cell of Islet of Langerhans to produce insulin (M Abu Zeid 2019). Similarly, while *Abelmoschus esculentus* is recognized in Iranian Traditional Medicine for its hypoglycemic effects (Afsharmanesh *et al.* 2024), *Momordica charantia, Caralluma russeliana, Rhizophora mucronata* and *Balanites aegyptiaca* are used in Asian medical folklore to regulate blood sugar. Some of these antidiabetic plants finding relevance with the Arabs are shown in Figure 1.

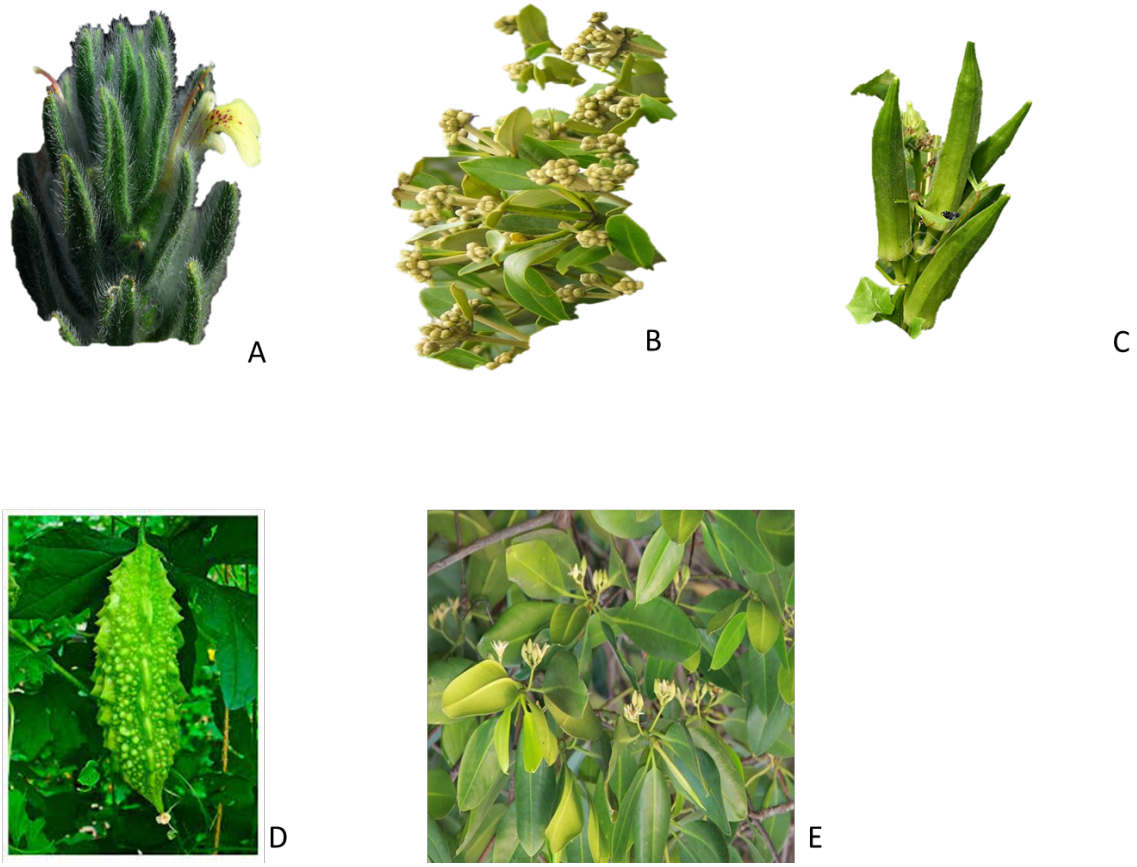

Figure 1. Some plants used by Arabians for diabetes
A = *Ajuga iva*, B= *Avicennia marina*, C = *Abelmoschus esculentus*, D = *Momordica charantia*, E = *Rhizophora mucronata*

Hypertension

Cardiovascular diseases are the leading cause of morbidity and mortality globally and hypertension is the 3rd in hierarchy (WHO 2017). The prevalence of high blood pressure in Arabian countries was estimated at 29.5% (Hashmi *et al.* 2020). Among the Lebanese, hypertension is very common and is responsible for the major cause of death. While believing that blood pressure regulation requires multiple approaches, herbal remedies have been proven effective to manage it. They take individual decoction of leaves of *Cupressus sempervirens, Allium ampeloprasum, Laurus nobilis, Portulaca oleracea, Urtica dioica* and *Paronychia argentea*, with each contributing to the control of hypertensive conditions (Samaha *et al.* 2019). In Pakistan, Iran and Afghanistan, the aqueous and methanol seed extracts of *Carum copticum* (*Ajwain*) are commonly used to control heart rate and blood pressure (Kamyab *et al.* 2021). Arabs believe in therapeutic tradition called prophetic medicine (الطب النبوي, *'al-Tibb al-nabawī*) conforming to the teachings of the last prophet of Islam, Muhammad (PBUH). The *al-Tibb al-nabawi* recommends the miraculous *Nigella sativa* for all illnesses except death (Khan 2019). The seeds of *N. sativa* reduce blood pressure through vasorelaxation due to its potential to block Ca^{2+} channels (Kamyab *et al.* 2021). Other mechanisms of its function include diuretic activity, angiotensin-converting enzyme (ACE) inhibition, lowering oxidative stress, and cardiac depressant activity (Maideen *et al.* 2020). *Daucus carota* (carrot) is used traditionally as an hypotensive agent and it enhances endothelial function and controls fluid balance (Kaur and Khanna 2012). Arabs also recognize the individual roles of *Allium sativum* and *A. cepa* in cardiovascular system due to their richness in useful secondary metabolites (Najeebullah *et al.* 2021). Due to the high prevalence of hypertension, *Hibiscus sabdariffa* commonly known as *Karkadeh* among Arabs is used to prepare hibiscus tea and incorporated into their diet, for its significant antihypertensive effect. The antihypertensive effects of *H. sabdariffa* are attributed to its inhibitory effect on ACE, as well as its diuretic and vasodilatory effects (Salem *et al.* 2022). The images of the representatives of plants used by the Arabs to control blood pressure are shown in Figure 2.

Figure 2. Selected plants used by Arabs for hypertension
A = *Cupressus sempervirens* (Italian Cypress), B = *Allium ampeloprasum* , C = *Carum copticum* seeds (Ajwain), D = *Nigella sativa* seeds (Black cumin seeds), E = *Daucus carota* (Carrot), F = *Hibiscus sabdariffa* (Roselle flower)

Liver Diseases

Liver is the largest organ in humans after skin. Avicenna, in his wisdom, opined that "liver is the seat of nutritive and vegetative faculties and the seat of manufacture of the dense part of humors" (Safadi 2024). The organ detoxifies drugs and harmful chemical substances and consequently protects the body against toxic materials. In performing these enormous functions, liver becomes vulnerable to high concentration of toxic chemicals or their metabolites thereby resulting to possible liver injury (Al-Asmari *et al.* 2014). Figure 3 shows some plants with phytotherapeutic properties against liver diseases. In Saudi Arabia, medicinal plants such as *Artemisia scoparia, Bacopa monnieri, Grewia mollis*, *Nigella sativa* and *Pergularia daemia* are used in the treatment of jaundice (Al-Asmari *et al.* 2014). The root of *Boerhavia diffusa* is hepatoprotective and used in traditional herbal medicine to treat spleen disorders, gall bladder problems andl inflammation (Khan 2019). Hepatitis is another deadly liver disease accounting for about 1.3 million deaths worldwide (Al-Asmari *et al.* 2014). The fruit juice of *Ecballium elaterium* is widely used among Libyans to treat hepatitis B and C (Res and 2014 2014). The whole plant of *Cydonia oblongata* is effective not only for hepatitis but also for digestive enteritis and whooping cough (Saganuwan 2010). Iranian traditional medicine relies on plants as hepatoprotective agents. For instance, *Allium hirtifolium* commonly called Persian shallot is very effective to restore liver damage due to antioxidant micronutrients in its extract (Kazemi *et al.* 2010). While the methanolic seed extract of *Apium graveolens* is used against liver disorder and the root is effective against dropsy and jaundice (Fazal and Singla 2012).

Kidney Diseases

Kidney diseases are categorized as non-communicable diseases (NCDs) and are very rampant in Arabian countries because of wide spread of risk factors such as obesity, hyperglycemia and high blood pressure (Farag *et al.* 2013). One of the commonest kidney diseases is nephrotoxicity arising from accumulation of toxins/toxic chemicals in the body. However, medicinal plants have proven to have renoprotective effects and plants such as *Bryophyllum calycinum* (Syn. *Kalanchoe pinnata* (Lam.) Pers) from the family Crassulaceae is extensively used among Arabs as a nephroprotective agent (Al-Snafi and Thuwaini 2018). Both the aqueous and hydroalcoholic extracts of the plant have demonstrated significant nephroprotective, antiurolithiatic and antidiuretic activities (Harlalka *et al.* 2007). The ethanolic and aqueous extracts of *Bauhinia variegata* also showed renoprotective activity by reducing creatinine in urine and blood urea nitrogen (Sharma *et al.* 2011). Similarly, the mixture of aqueous extract of *Foeniculum vulgare* seeds and *Solanum nigrum* fruits prevent renal failure and has remarkable antioxidant activities (Sharma *et al.* 2011). Other plants with renal protective activities include *Carum carvi* seeds, *Casuarina equisetifolia* leaves, *Cassia occiddentalis* leaves, *Citrullus colocynthis* fruits and *Daucus carota* roots (Al-Snafi and Thuwaini 2018), and some of them are presented in Figure 4.

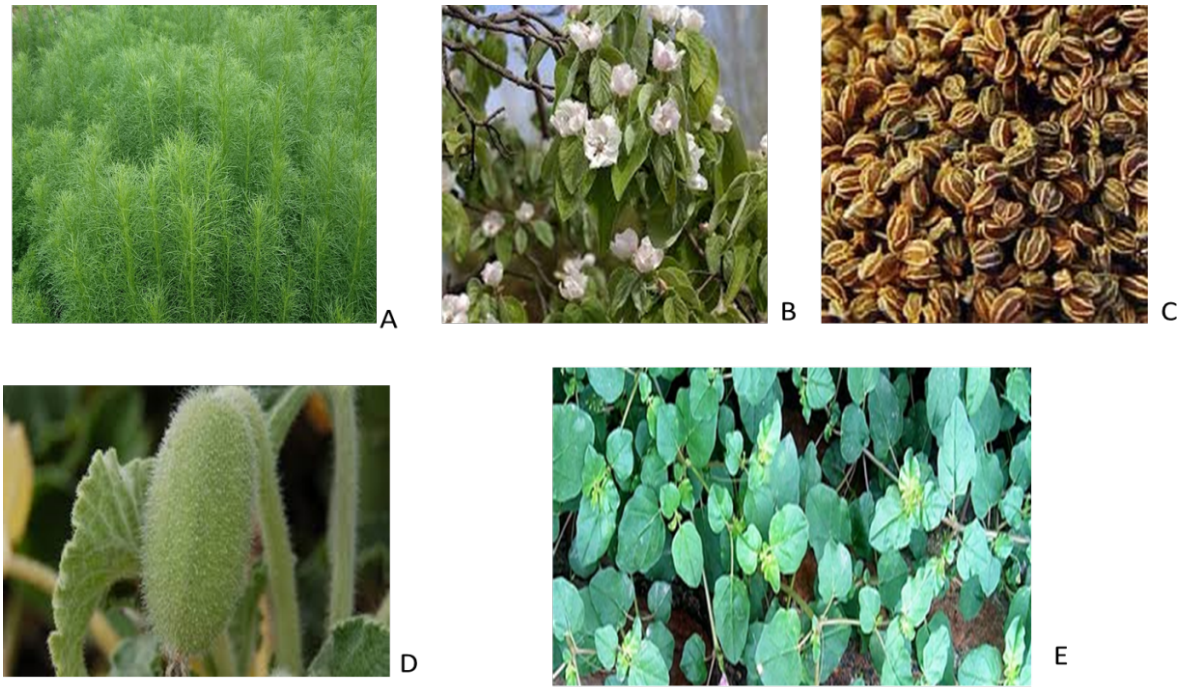

Figure 3. Selected plants used by Arabs against liver diseases
A = *Artemisia scoparia,* B = *Cydonia oblongata,* C = *Apium graveolens* seeds, D = *Ecballium elaterium* fruit, E = *Boerhavia diffusa*

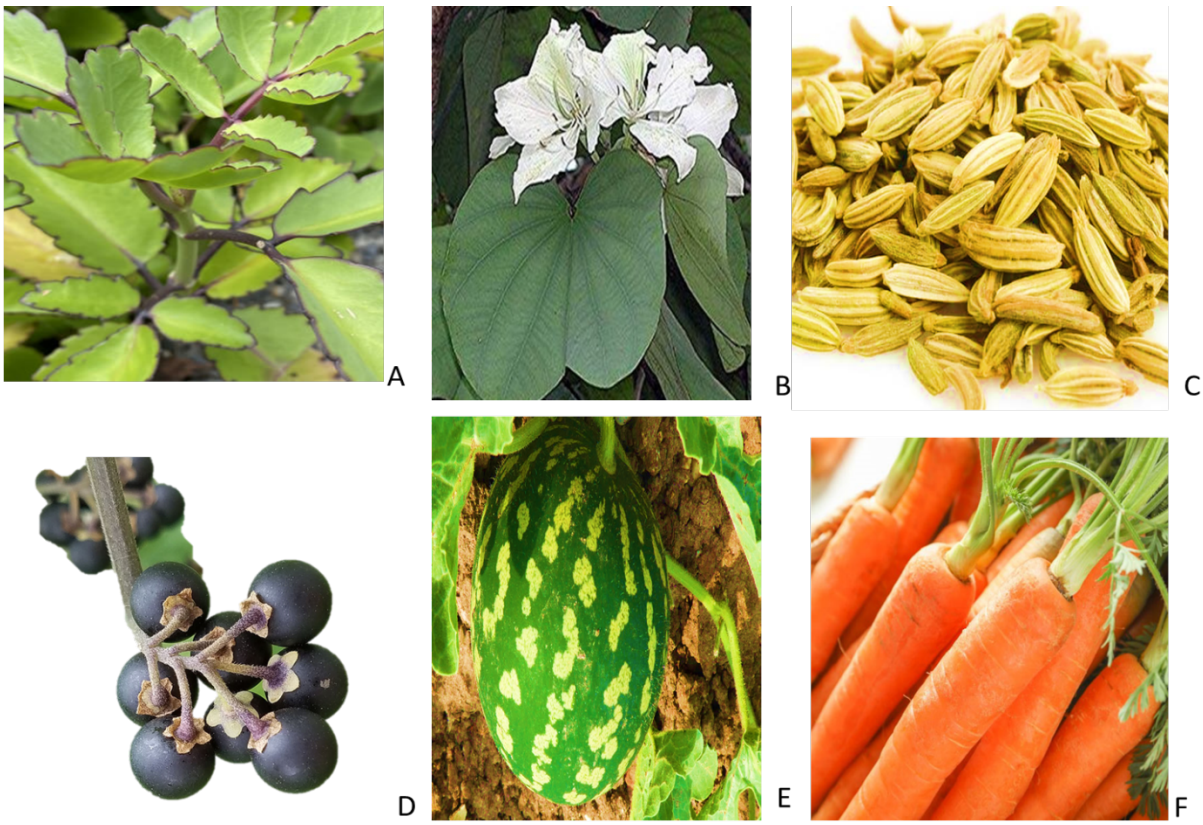

Figure 4. Selected plants used by Arabs for kidney diseases
A = *Bryophyllum calycinum,* B = *Bauhinia variegata,* C = *Foeniculum vulgare* seeds, D = *Solanum nigrum* fruits, E = *Citrullus colocynthis* fruit, F = *Daucus carota* modified roots

Skin Diseases

The skin is the largest organ covering the external part of the human body and it is susceptible to diverse infections due to its nature and location. Skin diseases are widespread in Asia, and several potent medicinal plants have been documented for their treatments. Among Arabs, *Acalypha fruticosa* and *Achillea biebersteinii* from the families Euphorbiaceae and Asteraceae, respectively are medicinal plants used for dermatological diseases or dermatoses, due to their metabolites that promote wound healing (Almoshari 2022). The leaf gel of *Aloe vera* is widely utilized among the Yemeni to treat a chronic autoimmune skin disease called scalp psoriasis and cracked feet (Dhabe *et al.* 2017). *A. vera* aids in deposition of collagen, improves scar strength and hasten healing of burns injury (Al-Snafi 2018). Saudi Arabians extract the latex from *Calotropis procera* and applied to the skin as an antimicrobial to treat leishmaniasis (El-Ghazali *et al.* 2010). Similarly, the leaf paste of *Ocimum basilicum* is placed on snake bites and bruises to avoid infection (Almoshari 2022). In Afghanistan, while the fruits, seeds, barks and roots of *Elaeagnus angustifolia* are prepared by decoction and taken orally to treat sunburn and skin wounds (Amini 2017), the leaf paste of *Withania somnifera* is very useful for chronic dermatitis (Awadh *et al.* 2017). The oil extracted from *Lantana camara* and *Juniperus oxycedrus* are used by Iraqians against eczema and skin itching, and the decoction of the seeds and leaves of *Ficus religiosa* for skin ulceration (Al-douri 2010). Yemeni burns the root of *Amaranthus spinosus* and prepare its paste with castor oil for eczema and other skin related diseases (Dhabe *et al.* 2017) . The representative images of some of the plants with reported uses against skin diseases are shown in Figure 5.

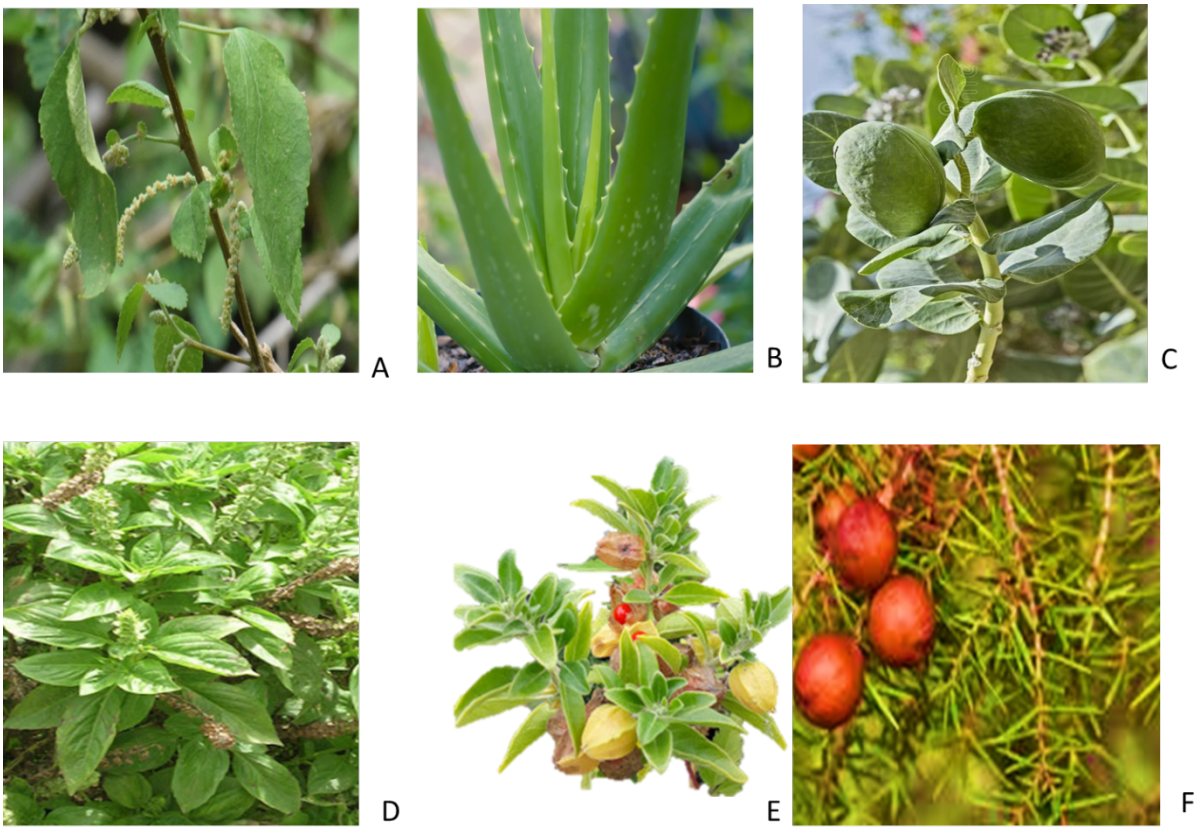

Figure 5. Some of the plants used by Arabs for skin diseases
A = *Acalypha fruticosa,* B = *Aloe vera,* C = *Calotropis procera,* D = *Ocimum basilicum,* E = *Withania somnifera,* F = *Juniperus oxycedrus*

Neurological diseases

In Arabian nations, neurological disorders are properly and effectively managed through traditional medicine practice using phytotherapy. In the Algerian Traditional Medicine, epilepsy is treated using the leaves of *Carlina gummifera, Bituminaria bituminosa, Passiflora incarnate* and *Galium verum* (Larit and León 2023). In the case of Alzheimer's disease, Egyptians confirmed the neuroprotective potency of *Emblica officinalis* fruits due to its Acetylcholinesterase (AChE) inhibitory properties and the tendency to enhance memory (Ali *et al.* 2013). *Withania somnifera* is another good candidate in managing Alzheimer's disease among Arabs. Its extract contains potent secondary metabolites that are capable of restoring synaptic functions and reverses mitochondrial dysfunction (Gregory *et al.* 2021). Another neuroprotective plant is *Ginkgo biloba*. Both

preclinical and clinical studies of its leaf extracts revealed that it enhances cerebral blood flow, block neural cell death and enhance hippocampal neurogenesis (Osman *et al.* 2016; Gregory *et al.* 2021). *Crocus sativus*, commonly called saffron, is a therapeutic agent in dementia as memory enhancer (Brondino *et al.* 2014). Figure 6 presents some of the neuroprotective plants commonly used by the Arabs.

Figure 6. Some plants used by Arabians for neurological diseases

Influence of Arabian Traditional Medicine on Modern Herbal Medicine and Pharmacology

The herbal medicine practice of the Arabs just like the other nations is a heritage that has been profoundly molded into modern pharmacology, offering a testament to the richness of ancient knowledge and its transformative impact on present-day science. The foundation of the modernized herbal medicine and pharmacology of the Arabs was laid during the Islamic Golden Age by prominent physicians who considered the integration of the medicinal traditions of various countries particularly Greece (Southeast Europe), Persia (located in the modern-day Iran), and India (Asia), creating a robust framework that emphasized systematic methodologies and holistic approaches to the health maintenance of the Arabs and the Muslims, in particular. This intellectual synthesis not only preserved earlier knowledge but also introduced groundbreaking advancements in herbal medicine (Renima *et al.* 2016; Rusydi 2023). Commemorative figures such as Avicenna (also known as ibn Sina), Al-Razi (Abū Bakr Muḥammad Ibn Zakariyyā), and Ibn Al-Bitar (Abu Muhammad Abdallah Ibn Ahmad Ibn al-Baitar) were among the outstanding contributors whose works established and molded pharmacology as a distinct and systematic science (Jani 2024). The compilation of five books otherwise referred to as Avicenna's Canon of Medicine, is a hallmark of this period. It offers rigorous classifications of medicinal plants, detailed descriptions of therapeutic methods, and comprehensive approaches to diagnosis and treatment (Aligabi 2020). Segregation of the roles of pharmacists and physicians in the Arabian medicine rebranded the practice of healthcare, a structure that continues to underpin advanced pharmaceutical principles.

Arabic medicine has had several successes, but one of its major highlights is integrating the traditional and the new medicinal practices (Mitha 2020). During this period, medication and therapy were singled out, which nurtured specialist practitioners at the beginning of pharmaceutical practices (Roohnavaz *et al.* 2022). They also prepared and compounded the medication while doctors diagnosed and treated illness. Such specialization of work allowed a deeper appreciation of applicability and use of medicines and their products. For example, earlier Arabian scientists used cutting-edge extraction technology to isolate essential components from plants such as *Hyoscyamus niger, Cannabis sativa*, and *Papaver somniferum*, which were used as anesthetics in operative procedures. This type of advancement changed professional practice and provided a basis for the practice of anesthesiology, illustrating the scientific picture of Arabian herbal heritage in these practices (Ahmed and Zargaran 2020).

Table 2. Specific Herbs and Remedies Used by Arab Herbalists

Herb	Arabic Name	Botanical Name	Family	i.	Applications	References
Black Seed	حبة السوداء **(Habat-ul-Sauda) or** حبة البركة **(*Habat -ul-Barakah*)**	*Nigella sativa*	Ranunculaceae	ii. iii. iv. v. vi. vii. viii. ix.	Anticancer Antimicrobial Antioxidant Anti-schistosomiasis activity Antidiabetic Immunomodulatory activity Analgesic Anti-inflammatory	(Ahmad *et al.* 2013)
Aloe Vera	صبار(*Sabbar*)	*Aloe vera*	Asphodelaceae	i. ii. iii. iv.	Wound healing Antifungal Immunomodulatory Anticancer	(Gupta and Malhotra 2012)
Fenugreek	الحلبة(*Hilbah*)	*Trigonella foenum-graecum*	Fabaceae	i. ii. iii. iv. v.	Hypatoprotective activity Hypocholesterolemic effect Antidiabetic Digestive stimulant Antioxidant	(Srivastava *et al.* 2010)
Clove	القرنفل(*Qurnafl*)	*Syzygium aromaticum*	Myrtaceae	i. ii. iii. iv. v. vi.	Antiproliferative effect on liver cirrhosis Antiulcer Reduces the risk of arterial sclerosis Enhances sexual behavior Prevents premature ejaculation Prevents memory deficits from oxidative stress	(Batiha *et al.* 2020)
Henna	حناء(*Henna*)	*Lawsonia inermis*	Lythraceae	i. ii. iii. iv. v.	Immunostimulant Antitrypanosomal Antifertility Antidermatophytic Tuberculostatic activity	(Chaudhary *et al.* 2010)
Senna	السنا (*Al-Sanā*)	*Senna alexandrina*	Fabaceae	i. ii. iii.	Antimalaria Antimicrobial Antidiabetic	(Oladeji *et al.* 2021)
Tumeric	كركم(*Kurkum*)	*Curcuma longa*	Zingiberaceae	i. ii.	Management of anxiety and arthritis Antioxidant	(Hewlings and Kalman 2017)

Thyme	الزعتر(*Za'tar*)	*Thymus vulgaris*	Lamiaceae	iii. i. ii. iii. iv.	Anti-inflammatory Antimicrobial Antiseptic Anthelminthic Insecticidal	(Reddy 2014)
Garlic	ثوم (*Thoum)*	*Allium sativum*	Liliaceae	i. ii. iii. iv. v. vi.	Antihypertentive Antimicrobial Antidiabetic Cardiovascular activities Hyperlipidemia Sickle cell anaemia management	(Tesfaye 2021)
Cinnamon	القرفة(*Qirfah*)	*Cinnamomum verum*		i. ii. iii.	To manage neurological disorders Cholesterol and lipid lowering effects Antioxidant	(Rao and Gan 2014)
Mustard	خردل(*Khardal*)	*Brassica nigra*	Brassicaceae	i. ii. iii. iv. v.	Bacteriostatic and antiviral activities Management of obesity Anticancer Regulation of blood sugar Antioxidant	(Tian and Deng 2020)
Dates	تمر (*Tamar*)	*Phoenix dactylifera*	Arecaceae	i. ii. iii. iv. v.	Antitumor effects Nephro-protective effects Delivery and labor relaxation Treatment of infertility Antioxidants	(Rahmani *et al.* 2014)
Onion	بصل(*Basal*)	*Allium cepa*	Liliaceae	i. ii. iii. iv. v.	Antiasthmatic Lowering blood pressure Control cholesterol levels Control gastrointestinal disorders Protect eyes against cataract	(Bhasker *et al.* 2018)
Barley	الشعير(*Sha'eer*)	*Hordeum vulgare*	Poaceae	i. ii. iii.	Aids in digestion Cholesterol-lowering properties Dietary therapy	(Newman and Newman 2008)
Juniper	العرعر(*Al-'Ar'ar*)	*Juniperus communis*	Cupressaceae	i. ii. iii.	Treatment of urinary tract Antidiuretic Anti-inflammation	(Al-snafi 2018)

Chamomile	بابونج(*Babunaj*)	*Matricaria chamomilla*	Asteraceae	i. ii. iii. iv.	Insomia Treatment of menstrual and gastrointestinal disorders Wound healing For rheumatic pain	(Srivastava *et al.* 2010)
Myrrh	مر(*Murr*)	*Commiphora myrrha*	Burseraceae	i. ii. iii. iv.	Treatment of trauma and arthritis Anti-inflammatory For coronary artery disease Treatment of gynecological diseases	(Shen *et al.* 2012)
Sumac	سماق (*Summaq)*	*Rhus coriaria*	Anacardiaceae	i. ii. iii.	Aids digestion Antioxidant Antimicrobial	(Rashid and Awla 2024)
Nutmeg	جوزة الطيب(*Jozat al-Teeb*)	*Myristica fragrans*	Myristicaceae	i. ii. iii. iv.	Treatment of dysentery, stomachache and rheumatism Antimicrobial Antimalaria Treatment of leprosy at the early stage	(Naeem *et al.* 2016)
Fig	التين(*Al-Teen*)	*Ficus carica*	Moraceae	i. ii. iii. iv.	For constipation For cardiovascular health Anti-obesity Control gastrointestinal disorder	(Sandhu *et al.* 2023)
Basil	الريحان(*Al-Raihan*)	*Ocimum basilicum*	Lamiaceae	i. ii. iii. iv. v.	Antimicrobial Cytoprotective activities Hypoglycemic and hypolipidemic properties Neuroprotective and renoprotective Anticonvulsant	(Bozyel *et al.* 2024)
Caper Bush	الكبر(*Al-Kabbar*)	*Capparis spinosa*	Capparaceae	i. ii. iii. iv.	Treatment of kidney and liver disorders Analgesic and carminative agents Anti-hemorrhoid and anti-rheumatic Skin diseases	(Annaz *et al.* 2022)

				v.	Gastrointestinal infections	
				vi.	Eye infections	
				vii.	Diabetic complications	
Tamarind	تمر هندي(al-tamr al-hindi)	*Tamarindus indica*	Fabaceae	i.	Cytotoxicity	(Bhadoriya *et al.* 2011)
				ii.	Antimalarial	
				iii.	Abdominal pain	
				iv.	Andiabetic	
				v.	Gonorrhea	
				vi.	Antiasthmatic	
				vii.	Antivenomic	
Cumin	الكمون(*Al-Kamoon*)	*Cuminum cyminum*	Apiaceae	i.	Aids digestion	(Johri 2011)
				ii.	Bronchopulmonary disorder	
				iii.	Active against morning sickness	
				iv.	Treats dyspeptic headache	
				v.	Active against gastrointestinal disorders	
				vi.	Treatment of toothache and leprosy	
Licorice (Liquorice)	العرقسوس(*Al-'Uroosus*)	*Glycyrrhiza glabra*	Fabaceae	i.	Antidiabetic	(Pastorino *et al.* 2018)
				ii.	Antioxidant	
				iii.	Antiviral	
				iv.	Antibacterial	
				v.	Anti-inflammatory	
Neem	النيم (Al-Neem)	*Azadirachta indica*	Meliaceae	i.	Anti-cancer activities	(Alzohairy 2016)
				ii.	Antioxidant	
				iii.	Hepatoprotective effects	
				iv.	Wound healing	
				v.	Antimicrobial	
				vi.	Antimalarial	
Ginger	زنجبيل (*Zanjabeel)*	*Zingiber officinale*	Zingiberaceae	i.	Cardiovascular and respiratory protective	(Mao *et al.* 2019)
				ii.	Neuroprotective	
				iii.	Anti-obesity	
				iv.	Antinausea	
				v.	Anticancer	
				vi.	Antimicrobial	
Walnut	الجوز (Al-Jawz)	*Juglans regia*	Juglandaceae	i.	Treats dermal inflammation	(Sharma *et al.* 2022)
				ii.	Treats eye infection	
				iii.	Rheumatic pain	
				iv.	Treatment of scalp dandruff	

Sage	الميرمية (*Al-Maramiyyah*)	*Salvia officinalis*	Lamiaceae	i. ii. iii. iv. v. vi.	Anticancer Antidementia Blood sugar regulation Dizziness Seizure and paralysis Antiulcer	(Ghorbani and Esmaeilizadeh 2017)
Mastic tree	المصطكى(*Al-Mastaki*)	*Pistacia lentiscus*	Anacardiaceae	i. ii. iii. iv. v.	Anti-inflammatory Antibacterial Anticancer Antioxidant Anti-atherogenic	(Soulaidopoulos *et al.* 2022)

The scope of impact of Arabian medicine is not limited to its history only; it has its tentacles in today's medicine as well. There exist many cures familiar to Arabian gerontologists, some of which include *Nigella sativa* (black seed) and *Cuminum cyminum* (cumin). These plants, which were popular in Arabian medicine for the treatment of diabetes, heart diseases and respiratory conditions, received much attention in modern pharmacological research as well. The affirmation of their bioactive substances points out to the great role of indigenous knowledge in solving present health problems (Allaq *et al.* 2020; Uddin and Nuri 2021; Wahab and Alsayari 2023). The properties, doses and methods of application of herbs from these plants were also systematically recorded by the Arab texts that made sure of the steady evolution of standardization that is in close similarity with the existing pharmacopoeia. Adherence to this principle guarantees both efficacy and safety of the treatment as well as the evidence-based application of traditional treatments. Also, the body of Arabian medicine which focused on the balance of the body, mind and environment remains relevant in these times that endorse the mixed modality of treatment that merges conventional and alternative medicine (Khoury *et al.* 2024).

The translation of classical medical printed work by Hippocrates and Galen by the Arab scholars among other books were translated into Latin. These texts, enriched with Arab innovations, became cornerstones of European medical education for centuries (Sholihah and Sari 2023). The compilation of Ibn Sina (Avicenna's Canon of Medicine), in particular, dominated medical curricula across Europe well into the seventeenth century, offering a systematic approach to diagnostics, therapeutics, and pharmacology (Aligabi 2020). Al-Razi's detailed clinical observations and Ibn Al-Bitar's encyclopedic works on botany and pharmacology provided invaluable insights into the properties and uses of medicinal plants (Tayjanov *et al.* 2021). These contributions influenced the development of Western pharmacology and introduced empirical observation and experimental approaches that remain integral to modern-day scientific investigations.

Future Directions and Preservation of Knowledge

In silico studies including molecular simulation, machine learning, neural networks and artificial intelligence for drug development are part of recent advancements in drug discovery and development that offer a valuable opportunity to rediscover and revitalize the Arabian herbal medicine in a short time and with minimal financial resources. The scientific achievements of the Islamic Golden Age that lead to the establishment of pharmacy and modern therapeutic practices needs to be re-engineered (Aligabi 2020; Shahpesandy *et al.* 2022). Despite the global shift toward Western medical practices, the Arabian pharmacopeia, with medicinal plants such as *Nigella sativa* (black seed) and *Olea europaea* (olive), continues to demonstrate significant therapeutic potential (Saad 2023).

Although, plants such as turmeric (*Curcuma longa*) and pomegranate (*Punica granatum*) are well-studied (Ge *et al.* 2021; Jyotirmayee and Mahalik 2022), many regional herbs from the Arabian plants remain largely unexamined. The future of this field therefore lies in expanding research into underexplored Arabian medicinal plants. While investigating these plants for novel bioactive compounds holds promise for addressing chronic diseases including diabetes, cardiovascular conditions, and cancer, preservation and advancement of Arabian herbal medicine is crucial to integrating it into modern scientific healthcare practice.

Conclusions

Arabian contributions to herbal medicine have shaped traditional and modern pharmacological practices, with figures like Avicenna, Al-Razi, and Ibn al-Baytar laying the groundwork for systematic herbal studies. Their meticulous documentation of medicinal plants and pharmacological principles continues to influence contemporary medicine. Despite the advancements, many Arabian medicinal plants remain underexplored in modern research. Further interdisciplinary studies combining historical knowledge with emerging technologies, such as AI-driven drug discovery, could unlock new therapeutic potentials. Recognizing and preserving this rich heritage is essential for advancing global herbal medicine.

Declarations

List of abbreviation: CNS: Central Nervous System; AD: *Anno Domini* (in the year of the Lord); ACE: Angiotensin-Converting Enzyme; NCDs: Non-Communicable Diseases; AChE: Acetylcholinesterase; TIM: Traditional Iranian Medicine; PBUH: Peace Be Upon Him; WHO: World Health Organization

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