Chapter

Traditional Islamic Herbal Medicine and Complementary Therapies

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Abstract

Herbal products found abundantly in several plants are the rich source of phytochemicals with a wide range of pharmacological activities and few adverse effects. Medicinal plants contain active ingredients that assist the body in reestablishing its natural balance and healing itself. Various herbs, which are commonly used in traditional Islamic medicine, can have an impact on human body systems. Natural products are primary sources of effective drugs with novel structures and distinct mechanisms of action for the treatment of various types of complications as well as the drug discovery process. The various pharmacological properties such as antimicrobial, anticancer, antioxidant, antihypertensive, immunomodulatory, anti-inflammatory and anti-diabetic properties of several natural products are well documented in the Ayurveda and Unani system of medicine. Some of the natural products' active ingredients have been documented, but the majority are still being researched as complementary medicine. As a result, more research is required to investigate their complementary medicine system. The present chapter provides a comprehensive update on selected traditional Islamic medicinal plants and their bioactive products mentioned in Islamic scriptures as complementary therapies to various diseases. The chapter also provides an in-depth update of pharmacological and clinical studies of natural products with special emphasis on cancer and diabetes.

Keywords: traditional Islamic herbs, complementary therapies, herbal products, pharmacological properties

1. Introduction

According to the World Health Organization, an estimated 80% of people around the world use herbal medicine. Studies show that certain herbs effectively treat several health issues, like allergies, premenstrual syndrome, chronic fatigue, cancer, diabetes and many more. India is one of the big resources of medicinal plants and natural products due to its geological diversity. In recent years, various

researches have been conducted on medicinal plants and spices worldwide. Plant-derived chemicals have attracted the attention of the scientific community for their various potential positive qualities. Studies have shown that polyphenols are anti-oxidants, anti-inflammatory, cardiac and neuroprotective, as well as having anti-cancer properties [1, 2]. Some of these natural chemicals have been included in clinical trials due to their inherent biological activity in a variety of disease models [3, 4], as they exhibited promising benefits in terms of boosting the anti-proliferative response and reducing the toxicity of conventional treatments.

Islamic medicine, often known as Arabic medicine in medical history, is the science of medicine developed during the Islamic Golden Age, which lasted from the ninth to thirteenth centuries. Although the main medical tradition was Greek, it was influenced by Islamic or Prophetic Medicine, as well as folk medicine to a lesser extent. The Holy Quran has provided the knowledge for a variety of crops, including grains, seeds, and fodder, as well as their germination and growth processes in several Surah. Plants are considered a gift from God, and the Quran mentions various plant names such as Date palms, figs, olives, ginger, grapes, miswak, onion, barley, garlic, pomegranates, camphor, Christ's thorns, bottle gourds and other significant therapeutic herbs and plants utilized as food [5, 6].

Various medicinal plants and nutraceuticals derived from different natural resources, as well as their products such as polyphenolic components, flavones, flavonoids, and antioxidants, have been found to provide significant protection against a variety of diseases [7]. Epidemiological observations show that various traditional Islamic medicinal plants have powerful disease inhibiting properties [6, 8]. Currently, developing a preventive/therapeutic drug that reduces the particular disease without harming normal cells, is the primary goal of the research performed. For instance, in the case of cancer treatment, some of the methods used by the experts to cure the condition include tumor debulking, chemotherapies, radiotherapies, targeted treatments, immunotherapies, stem cell transplants, and photodynamic therapies [9]. Around the world, researchers are trying to develop new strategies to eradicate the diseases.

The present chapter summarizes the recently reported pharmacologically and therapeutically based medicinal plants and its products mentioned in Islamic scriptures. The chapter also highlights the recent studies of medicinal plants and their natural products based on *in vitro* and *in vivo* and clinical investigation.

2. Traditional Islamic medicinal plants and their products

2.1 Dates palm (*Phoenix dactylifera* L.) fruits

Phoenix dactylifera L. (*P. dactylifera*), often known as date palm, is one of the oldest and most important crops in Arab countries and North Africa. Apart from that, dates are also cultivated around the world and in India, southern California, Arizona and Texas [10]. The date palm tree is a part of the family Arecaceae. Date palm is a multifunctional plant that contains fiber, carbohydrates, minerals, vitamins and various phytochemicals, which were used traditionally because of having great therapeutic properties [11]. Therapeutic benefits of Ajwa dates fruits are well documented in Islamic scriptures such as Hadith and other works of Islamic literature. According to Al-Bukhaari (5445) and Muslim (2047), narrated by Sa'd ibn Abi Waqqaas that the Prophet (PBUH) said: "Whoever eats seven Ajwa dates in the morning, will not be harmed by any poison or witchcraft that day."

Date palm fruit has been described in traditional and alternative medicine to provide several health benefits including anticholesteremic, antidiabetic,

anti-inflammatory, antioxidant, hepatoprotective and anticancer effects [12]. According to prior phytochemical studies, Date pulp fruit contains about 80% reducing sugars, including fructose, glucose, galactose, and maltose, as well as flavonoids, glycosides, polyphenols, and phytosterols [13, 14]. Phytochemicals present in dates palm fruits exhibit anti-inflammatory, cardioprotective, antioxidant, hypolipidemic and anti-apoptotic properties [15]. The main bioactive components present dates palm pulp are Carotenoids (lutein and β-carotene), phytosterols and phytoestrogens (β-sitosterol, stigmasterol, campesterol, daidzein, genistein and isofucosterol), flavonoids (apigenin, luteolin, quercetin, isoquercetrin, rutin and kaempferol) and phenolic acids (benzoic acid derivatives; p-hydroxybenzoic acid, protocatechuic acid, vanillic acid, gallic acid and syringic acid, and cinnamic acid derivatives; o-coumaric acid, p-coumaric acid, caffeic acid, and ferulic acid) (**Figure 1**) [10, 16].

2.1.1 Utilization of date palm fruit and its products as complementary therapies

2.1.1.1 Cancer

The ethyl acetate fraction of *P. dactylifera* fruit extract has shown the antifibrotic (expression of fibronectin-1 and alpha-smooth muscle actin) and antiproliferative activity in tumor necrosis factor (TNF) stimulated pancreatic cancer cells *in vitro* [10]. In addition, the ethyl acetate fraction of *P. dactylifera* has shown the anticancer effect against prostate cancer cells [17], ethyl alcohol extract against human hepatocellular carcinoma hepatoma G2 (HepG2) cells and triple-negative mammary carcinoma MDA-MB-231 cells [18, 19] and methanolic extract against human breast adenocarcinoma Michigan Cancer Foundation-7 (MCF-7) cells *in vitro* [20]. In a previous study, an aqueous extract of *P. dactylifera* has shown the anticancer potential in diethylnitrosamine-induced hepatocellular carcinoma in *Wistar* rats [21]. *P. dactylifera* has improved the treatment outcome of pediatric cancer patients clinically [22].

2.1.1.2 Diabetes

Low glycemic index (GI) diets have been proven to be effective in the treatment of diabetes. Dates can be classed as a low GI superfood because of their high fructose content, which is sweeter and less diabetogenic than glucose [23]. *P. dactylifera* fruit based-diets have alleviated hyperglycemia in alloxan-induced diabetic rats [24].

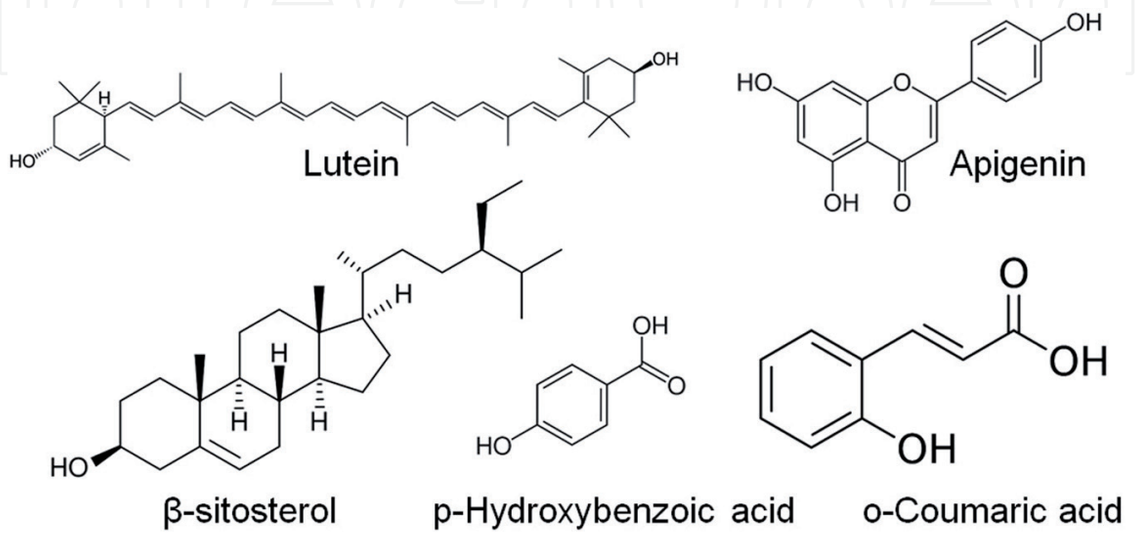

Figure 1.
*Chemical structure of principal bioactive components found in date palm (*Phoenix dactylifera *L.) fruits.*

A previous study has revealed significant anti-hyperglycemic effects of dates fruits in diabetes management of hyperglycemic Sprague-Dawley rats [25] and diosmetin glycosides isolated from the epicarp of date fruits have significantly alleviated the biochemical profile of alloxan diabetic male rats [26].

2.1.1.3 Antibacterial and antiviral

The use of dates is also important for antimicrobial activities. The *in vitro* studies have demonstrated that date fruit exhibits antibacterial, antiviral, anti-inflammatory and anti-angiogenic activity [15, 27].

2.1.1.4 Hepatoprotective and antioxidant

Date palm fruit has shown the protective effect on dimethoate induced-oxidative stress in rat liver [28]. Moreover, date palm fruits have shown anti-hyperlipidemic and hepatoprotective effects in hyperlipidemia and fatty liver male albino rats [29].

2.1.1.5 Pregnancy and delivery

The use of dates is especially important for pregnant and postnatal women. Women who consume dates before and after giving birth might strengthen their uterine muscles by consuming dates [20]. Consumption of date fruit in the last 4 weeks before labor reduced the need for initiation and augmentative labor and resulted in a better delivery outcome [30]. Due to their high fiber, iron and trace element contents, as well as their high energy and low GI, date fruits seem to be the ideal superfood for today's health-conscious age.

2.2 Fig (*Ficus carica*) fruit

One of the largest angiosperm genus, Ficus belonging to the family of Moraceae (Mulberry) are perennial plants comprising of over 800 different species including climbers, trailers, and epiphytes distributed around the tropical and sub-tropical regions worldwide [31, 32]. *Ficus carica* (*F. carica*), a deciduous dicotyledonous tree is the most important member of the genus commonly referred to as 'fig'. Indigenous to Egypt (East Mediterranean region), *F. carica* was initially introduced to different civilizations throughout the world including England, United States (US), East and West South Central, South Atlantic and Pacific [33]. Despite, its origins in the Sub-Himalayan regions of the Bengal and Central Indian subcontinents, it has been widely cultivated all around the globe. However, some of the world's major producers of figs for their dry and consumption were US, Turkey and Greece [33].

Bush/small tree-like appearance with single, alternating and large foliage, deep lobes with three or seven lobes; rough and hairy on the top surface; soft and hairy underneath along with smooth and gray bark. In addition to being cultivated from ancient times, they were found growing in the wild in dry and sunny places with rich and fresh soil, as well as in rocky locations. A reasonably permeable and easy draining soil is ideal for the plant's growth; nevertheless, it can also grow in nutritionally poor soil [34]. The edible part of *F. carica*, the fruit is seed-bearing, fleshy, hollow, and receptacle-shaped. Figs do indeed have a long history of medicinal, mythological, and ecclesiastical applications [35–38]. They are bad cholesterol-free, low in sodium and an excellent source of minerals (K, Zn, Mg, Fe, N, Ca, and P), dietary fibers, carbohydrates, sugars, vitamins (water-soluble—B1, B2, B3 and C; fat-soluble—A), good cholesterol and essential amino acids.

Figs have acquired a considerable amount of folkloric importance and still invite the attention of researchers globally for their pharmaceutical properties to be used as complementary medicine. Ayurveda, Unani, and Siddha are the classical medicine systems of Ayurveda that have acknowledged the medicinal benefits of fig [39]. Therefore, it promises to treat and cure disorders of endocrine (diabetes), ventilatory, cardiovascular, digestive (ulcers and vomiting), urinary, reproductive (menstrual discomfort), and immune systems, as well as infectious diseases of the skin, scabies, and gonorrhea [40].

Phytochemical analysis results revealed a number of secondary metabolites being isolated from different parts of *F. carica* which are phytosterols, anthocyanin pigments, essential amino acids, phenols (proanthocyanidins), essential fatty acids, triterpenoids, coumarins, alcohols, and other volatile counterparts [41, 42].

Linolenic acid (53.1%) was found to be the most prominent fatty acid present in dried figs followed by linoleic acid (21.1%), palmitic acid (13.8%), and oleic acid (9.8%) [41]. Phenolic compounds; 3-O- and 5-O-caffeoylquinic acids, ferulic acid, quercetin-3-O-glucoside, quercetin-3-O-rutinoside, psoralen, and bergapten isolated from the fruit pulp [43]. However, numerous volatile components namely 3-methyl-butanal, 2-methyl-butanal, (E)-2-pentanal, hexanal, heptanal, octanal, and nonanal, 1-penten-3-ol, 3-methylbutanol, benzyl alcohol, (E)-2-nonenol, and phenylethyl alcohol, ketone: 6-methyl-5-hepten-2-one, esters: methyl hexanoate, methyl salicylate, and ethyl salicylate, limonene, menthol, α-pinene, β-pinene, linalool, eucalyptol, α-cubenene, copaene, β-caryophyllene, τ-muurolene, τ-cadinene, and germacrene D and β-cyclocitral were found in the *F. carica* fruits (**Figure 2**) [44].

The fruits have emerged as an outstanding complementary medicine that could be used in treating leprosy, nasal hemorrhage, and deficiency disorders as well as are used in various drug preparations [45].

2.2.1 Utilization of F. carica *fruits and its products as complementary therapies*

2.2.1.1 Cardioprotective (hypotensive effect)

F. carica is one of the five plants mentioned in the Quran widely used in the treatment of cardiovascular diseases. Nevertheless, its hypertensive properties are not well documented. However, a study reveals that fruit extract of *F. carica*

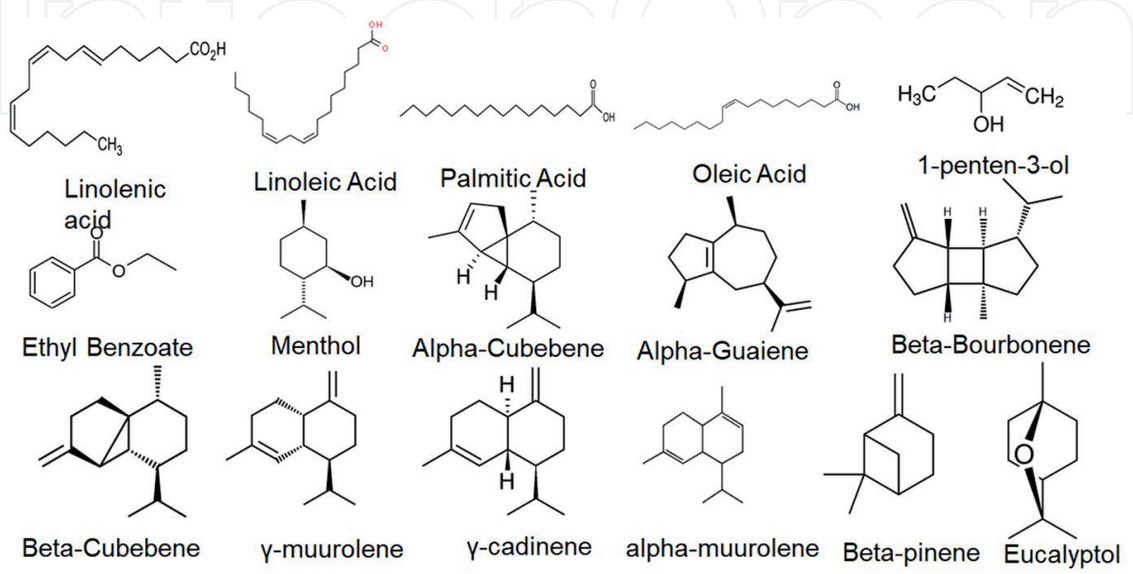

Figure 2.
*Chemical structure of principal bioactive components found in fig (*Ficus carica*) fruits.*

significantly reduced the level of blood pressure in normal as well as glucose-treated (hypertensive) rats. This effect has been attributed due to the presence of flavonoids, phenols and potassium ions which alter the level of glucose/fructose stimulating cardioinhibitory, antihypertensive and diuretic effects [46].

2.2.1.2 Cancer

Methanolic fruit extract of *F. carica* possessed antiproliferative activity against hepatocyte-derived carcinoma cells with an IC_{50} value >2000 μg/mL [47]. Virtual screening, molecular docking and dynamics simulation investigations were combined to give a structural insight into the putative binding mechanism of prospective drug-like phytocomponents of *F. carica* with crucial molecular targets which play a significant role in the pathogenesis of several cancer. β-Bourbonene was found to show the best binding with topoisomerase-I, topoisomerase-II, and Vascular Endothelial Growth Factor-2 (VEGFR-2), thereby, altering their functions to alter the pathogenesis [48].

2.2.1.3 Antioxidant and antihyperlipidemic activity

Methanolic fruit extract of *F. carica* revealed strong antioxidant activity against 2,2-diphenyl-1-picrylhydrazyl (DPPH) dye with an IC_{50} value of 13.402 μg/mL [47]. The most prominent phenolic compounds: quercetin 3-O-rutinoside, dihydroxybenzoic acid di-pentoside and apigenin 8-C-glucoside were most abundantly present in the aqueous-ethanolic extract of Tunisian *F. carica*. Due to these phytoconstituents, improved antioxidant status and lower lipid peroxidation were observed suggesting their protective role [49].

2.2.1.4 Anti-diabetic activity

As a promising nutritional intervention for acute postprandial glucose and insulin homeostasis, *F. carica* fruit supplementation might also be used in the treatment of severe metabolic diseases such as hyperglycaemic condition and type 2 diabetes mellitus to optimize the glucose level in these conditions [50].

2.2.1.5 Antispasmodic and antiplatelet activities

In a previous study, it has been found that the fig seems to have a spasmolytic action that might be mediated by activation of the K^+-ATP channel, which supports some of its therapeutic uses in hyperactive gastrointestinal illnesses, and its antiplatelet effect [51].

2.3 Black cumin (*Nigella sativa*) seed

Nigella sativa (*N. sativa*, family Ranunculaceae), popularly known as black seed or black cumin or Kalonji in Hindi, is an annual herb with various pharmacological properties and a widely used medicinal herb across the world with a rich historical and religious background. *N. sativa* is native to Southern Europe, North Africa and Southwest Asia and it is grown in many countries around the world like the Middle Eastern Mediterranean region, South Europe, India, Pakistan, Syria, Turkey, Saudi Arabia [52, 53]. Black seeds and oil have been used in traditional medicine for more than 2000 years, and Hippocrates and Discroides termed it “the Melanthion” [54]. It is an important drug in various traditional system of medicine like Unani and Tibb, Ayurveda and Siddha. Traditionally, *N. sativa* has been used to treat a wide

range of illnesses, diseases, and conditions affecting the respiratory system, digestive tract, kidney and liver function, cardiovascular system, and immune system, as well as for overall well-being [55]. In Arabic, *Nigella* is known as 'Habbatul barakah', which means the seed of blessing. In Islam, It is considered as one of the most effective kinds of curing medicine available as it was stated in one of the Prophetic hadiths that black seed is the remedy for all illness except death. In Tibb-e-Nabwi (Prophetic Medicine), it is suggested to use it on a regular basis [56]. Black seeds have quite a rich history of folkloric use as food and medicine in Indian, Arabian, Southeast Asian, and Middle Eastern civilizations, and have traditionally been used to cure asthma, bronchitis, rheumatism, and other inflammatory illnesses. Extract prepared from black seed is used for the treatment of indigestion, diarrhea, loss of appetite, amenorrhoea, dropsy, and dysmenorrhoea and useful in the cure of skin eruptions and worms [57].

Various therapeutic attributes of black seed and its active component thymoquinone have been shown in *in vitro* and *in vivo* investigations, including anti-cancer [58], anti-microbial [58], anti-pyretic, contraceptive and anti-fertility, anti-oxytocic [52], antitussive, anti-inflammatory [59], and antioxidant properties [60]. Black seed has been shown to have anticancer action in blood, breast, colon, pancreatic, liver, lung, fibrosarcoma, prostate, and cervical cancer cell lines, as well as in animal models of lung, kidney, skin, colon, and breast cancer [61]. Phytochemical investigation of *N. sativa* revealed the presence of hundreds of phytoconstituents, mostly alkaloids, saponins, sterols, and essential oil.

The most important active compounds are thymoquinone (30–48%), thymohydroquinone, dithymoquinone, p-cymene (7–15%), carvacrol (6–12%), 4-terpineol (2–7%), t-anethol (1–4%), sesquiterpene longifolene (1–8%) α-pinene and thymol [62]. Among the various active components reported thus far, thymoquinone, which is a major component of essential oil, is the most bioactive chemical and has a variety of therapeutic properties (**Figure 3**).

2.3.1 Utilization of black seed and its products as complementary therapies

2.3.1.1 Anticancer activity

Thymoquinone, the active compound of the black seed helps to train T cells *in vitro* for adoptive T-cell therapy against cancer and infectious diseases. The cytotoxic effects of different Black seed extracts as an adjuvant therapy to doxorubicin on human MCF-7 breast cancer cells was reported. The lipid extract of black seed was found to be cytotoxic against MCF-7 cells, with a lethal concentration 50 (LC_{50}) of 2.720 ± 0.232 mg/mL, while the aqueous extract was found to be cytotoxic at concentrations as high as 50 mg/mL. *In vitro* and *in vivo* studies showed the

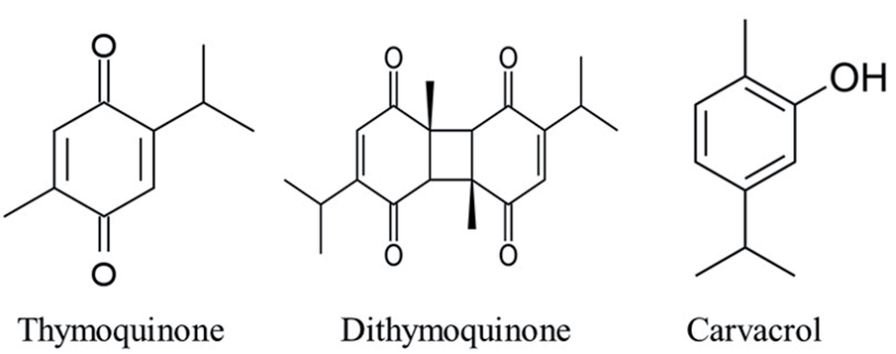

Figure 3.
*Chemical structure of principal bioactive components found in black cumin (*Nigella sativa*) seed.*

antitumor and anti-angiogenic effects of thymoquinone on osteosarcoma [63]. Thymoquinone induced a higher percentage of growth inhibition and apoptosis in the human osteosarcoma cell line sarcoma osteogenic-2 (SaOS-2) and inhibits tumor angiogenesis and tumor growth through suppressing nuclear factor kappa light chain enhancer of activated B cells (NF-κB) and its regulated molecules. Thymoquinone cytotoxicity was also studied in human cervical squamous carcinoma cells (SiHa). Thymoquinone's anticancer effects on breast cancer cells, as well as its potential effect on the peroxisome proliferator-activated receptors (PPAR)-activation pathway, were investigated [64]. It was discovered that thymoquinone had a strong antiproliferative effect in breast cancer cells, and cytotoxicity was increased when thymoquinone was combined with doxorubicin and 5-fluorouracil. Migration and invasive properties of MDA-MB-231 cells were also reduced in the presence of thymoquinone. *N. sativa* volatile oil in the diet of male Wister rats for 30 weeks significantly reduced malignant and benign colon tumor sizes, incidences and multiplicities.

2.3.1.2 Antimicrobial activity

Black cumin is one of the most inspirational medicinal plants, with potent antibacterial, antifungal, antiviral, and antiparasitic properties. Thymoquinone isolated from *N. sativa* seeds showed a broader spectrum of antibacterial activity against gram-positive and gram-negative bacteria, including *Bacillus*, *Listeria*, *Enterococcus*, *Micrococcus*, *Staphylococcus*, *Pseudomonas, Escherichia, Salmonella, Serovar,* and *Vibrio parahaemolyticus*, as well as inhibiting the formation of bacterial biofilms [65]. Different extracts of black cumin and thymoquinone were found to have potent fungicidal activity against dermatophyte strains such as *Trichophyton mentagrophytes* and *Microsporum gypseum*, which was superior to fluconazole but not as potent as ketoconazole [65]. Complete recovery and retroversion of a 46-year-old HIV-positive patient were observed after therapy with 10 mL of black seed twice daily for 6 months, according to a case report done by Onifade et al. [66]. In a mouse model, *N. sativa* seed oil was observed to reduce viral load to undetectable levels in the liver and spleen after 10 days of intraperitoneal injection [65].

2.3.1.3 Antioxidant activity

In vivo and *in vitro* investigations have shown that *N. sativa* possesses potent antioxidant properties [67]. Collagen-induced arthritis was used to test the antioxidant and antiarthritic effects of thymoquinone in *Wistar* rats [52]. After two months of contemporaneous ingestion of *Allium sativum* and *N. sativa* seed, plasma malondialdehyde (MDA) levels were significantly reduced, with enhanced activity in erythrocyte glutathione peroxidase (GSH-Px) and superoxide dismutase [68].

2.3.1.4 Antidiabetic activity

The administration of black cumin seed to streptozotocin-induced diabetic rats for one month resulted in a significant decrease in fasting plasma glucose, serum MDA, interleukin-6, and immunoglobulin A, G, and M, as well as a significant increase in endogenous antioxidant enzymes such as SOD, Glutathione-S-transferase, and catalase expression. Diabetes-induced elevations in tissue MDA and blood glucose were greatly reduced in rats treated with *N. sativa* extract and oil, as well as thymoquinone, and serum insulin and tissue SOD were dramatically enhanced. *N. sativa* and thymoquinone have been shown to be effective in the treatment of diabetics and the preservation of -cells from oxidative stress [69].

A placebo was given to 99 diabetic patients in an experimental randomized controlled study, while two treatment groups received oral black seed oil. Black seed oil at 1.5 and 3 mL/day for 20 days resulted in significant reductions in glycated hemoglobin A1c and random blood sugar levels [70].

2.3.1.5 Antihypertensive activity

According to a nonrandomized controlled trial, 57 patients who were given 2 g daily supplements of black cumin for one year showed a significant reduction in systolic, diastolic, and mean arterial BP, heart rate, TC, LDL-c, the fractions of TC/HDL-c, and LDL-c/HDL-c, while serum HDL-c was suggestively raised when compared to baseline values and the control group. It was also used to assess the blood pressure-lowering capability and possible processes of *N. sativa* in a rat model, and it was discovered that the seed oil and nicardipine-treated groups had significantly lower blood pressure [71].

3. Conclusions

Medicinal plants are great sources of phytochemicals, which are abundant in a variety of plants and have few negative effects. They include active chemicals that help the body recover itself and re-establish its natural equilibrium. Traditional Islamic natural products are important sources of therapeutic medications with innovative structures and modes of action for the treatment of a variety of ailments as well as the drug discovery process. The recently reported pharmacologically and therapeutically based medicinal plants and their products that are mentioned in Islamic scriptures are presented in this chapter. The current study also emphasizes recent *in vitro*, *in vivo*, and clinical investigations of medicinal plants and their natural compounds. According to these reports, dates palm fruits, figs, and black seeds can be used for a variety of therapeutic applications, and these plant products may hold substantial promise for the development of novel therapeutic strategies for a variety of human diseases.

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Conflict of interest

The authors declare no conflict of interest.

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