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Review Article

Laurus nobilis L., (Habb-ul-Ghar), A Review on Phytochemistry, Pharmacology and Ethnomedicinal Uses

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Abstract

Habb-ul-Ghar (*Laurus nobilis* L., fruit) is used in the Unani and other traditional systems of medicine since ancient times. It has been also used in culinary and pharmaceutical industries. Various phytoconstituents were isolated from laurel fruit, like monoterpenes, sesquiterpenes, fatty acids, flavonoids, phenolic acid, and some minerals. Many pharmacological studies have been carried out to explore its anti-oxidant, antimicrobial, antiproliferative, antinociceptive, and anti-inflammatory activities. This review will provide a comprehensive overview only about fruit of *Laurus nobilis* with special reference to Unani medicine.

Keywords: Habb ul Ghar; *Laurus nobilis*; Laurel fruit; Unani medicine

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INTRODUCTION

As the name implies, the Unani system of medicine has its roots in ancient Greece and has been further refined by Roman, Arabic, Spanish, Iranian, and Indian physicians. As a result, Greco-Arab Medicine was born. It is a holistic medical system that systematically addresses various health and illness conditions. It involves healthcare that is preventive, curative, and rehabilitative. According to the Unani concept, the human body comprises seven basic components: element, temperament, humour, organ, pneuma, faculties, and functions. The mere absence of any components directly impacts life's very existence, and its imbalance leads to disease. The Medicatrix Naturae (*Ṭabī'at mudabbira-i-badan*), according to the Unani system of medicine, is the supreme power that regulates all physiological functions of the body, gives resistance to diseases, and promotes natural healing. The system's foundations, diagnostic, and treatment techniques are based on scientific principles and holistic health and healing theories. Rather than taking a reductionist view of sickness, it uses a holistic approach that considers the entire individual[1].

Laurus nobilis L., commonly known as laurel or sweet bay, is a perennial shrub or tree, a native of the Mediterranean countries, widespread in temperate and warm regions[2]. In Unani system of medicine, its fruit is used with the name of *Habb-ul-Ghar*[3]. Fareed Ahmad Abbasi mentioned in *Saidla Al-Jameela* that *Asqaliboos Awwal* (Asklepiades, 1st Century) has started preparation of *Tiryaq* (antidote) from single ingredient *Habb-ul-Ghar*. Later, Unani physician *Indru Makhiz* added four ingredients and give the name '*Tiryaq Arba*'[4]. The popularity of *Tiryaq Arba* is growing in the current epidemic situation, where it can be used as a preventative medicine[5]. It is widely cultivated in Europe, America, Western Asia, Northern Africa, Arabian countries, and India[6,7]. The essential oil can be extracted from the plant leaves and fruits, while fixed oil derived mainly from the berries. Bay laurel essential oil has been discovered to have a variety of remarkable qualities that have a wide range of potential applications in various fields, including seafood, meat preservation, veterinary, and cosmetics, as well as health[8]. The usage of laurel in cuisines has become more widespread in recent years, with its notably fragrant leaves and berries being used in various culinary preparations[9]. Moreover, the fruits and leaves of *L. nobilis* have been used in traditional medicine for rheumatism, dermatitis, viral infections, antiseptic, hysteria, emmenagogue, diuretic, general gastric secretion stimulant, carminative, diarrhoea, and antidote in snake bites since antiquity[6,10–12].

MATERIAL AND METHODS

Habb-ul-ghar was explored in classical Unani literature for its temperament (*mizaj*), medicinal properties and therapeutic uses. Urdu translation of the classical books such as *Al Jami ul Mufradat Al Advia Wal Aghzia* of Ibn al Baitar (1197-1248 AD), *Muheet Azam* of Hakeem Mohammad Azam Khan (1806–1902 AD), *Khazainul Advia* of Najmul Ghani, (19th century), *Al Mukhtarat fit Tib* of Ibn Hubl Baghdadi (1122 -1213 AD), and *Tazkira Oolul Albab* (Arabic) of Dawud al Antaki (1541-1599 AD), *Tuhfat ul Momineen* (Persian) of Momin Tonekaboni (1669 AD), etc., were conferred. Published works available on PubMed, Science Direct, and Google Scholar were referred to collect all the available information regarding its phytochemicals and pharmacological studies. Standard Unani Medical Terminology published by Central Council for Research in Unani Medicine in collaboration with the World Health Organization was used to describe the appropriate Unani terminologies.

DESCRIPTION OF *HABB-UL-GHAR* IN UNANI LITERATURE

Table 1: Common name in a different region

Region / Language	Common name
Arabic	Ghar[3]
English	Sweet bay laurel, Victor's laurel[13]
France	Apollo's laurel, Laurier D Apollon[14]
India	Hab-el-ghar[13]
Iran/Persian	Barg Boo, Laurel tree, sweet bay[14], Bahishtan[3,15]
Italy	Alauro, Lauriello, Lobeerfrucht[14]
Japan	Gekkeiju, Bay laurel[14]
Morocco	Habbet ul Ghar, Asat Sinda Musa[14]
Tunisia	Laurier sauce, Rend[14]
Unani	Daphni[6,15]

Morphology (*Māhiyat*): *Habb-ul-ghar* is the fruit of a large tree that lives long nearly one thousand years[16,17]. It is smaller than *Funduq* (fruit of *Sapindus trifoliatus*) but similar to the fruit of Neem (*Melia azaderachta*). Leaves resemble *Barg Aas* (leaves of *Myrtus communis*), giving a particular fragrance on mashing like *Badam Talkh* (*Prunus amygdalus*)[3,18]. The peel of the fruit is off-white blackish but very thin and fragile. Fruit divide into two parts on rubbing between two fingers. The seeds are hard, shiny, smooth surface, orange in colour, and possess a slight fragrance[3,19]. The fruits are bitter but fragrant[20,21]. Berries and bark are used alone or as an ingredient of compound formulations in the Unani system of medicine. It is mainly found in Asia Minor and Europe. In India, it was trying to be cultivated on Nilgiris hills but unable to grow properly, so it is imported from abroad[22].

Parts used (*Hasas-i-Musta'mla*): In Unani system of medicine mostly fruits and essential oil are used,[3,16,19–21,23] but leaves and other parts are used in other traditional systems of medicine[6,13,14,24,25].

Temperament (*Mizāj*): The temperament of drugs has remained key to the theory of drug action in the Unani system of medicine, and it is one of the basic fundamental concepts. The temperament of a person and the drug's temperament serves as a conceptual framework for adequately using the medicine, predicting its effect on the body, and serving as an indicator of drug potency. Unani physicians have divided the drugs into four categories (hot, cold, wet, and dry) in terms of their effect on a moderate human body. The temperament of *Habb-ul-Ghar* is hot and dry in the second degree[18,21,22]; Hot and Dry in third-degree[17,26].

Action and uses (*Afʿāl aur Mawāq-i-istemāl*)

It has several pharmacological properties such as *Muḥallil-i-awrām* (resolvent: a substance that dissolves thick and viscous humour, hence reducing inflammation and swelling), *Musakkin-i-alam* (analgesic: an agent which relieves the pain), *Muḥarrik-i-aʻsāb* (nervine stimulant: an agent which stimulates the nerves). *Mufarriḥ* (refrigerant: a drug that reduces tachycardia, palpitation of heart and thirst), *Muqawwi* (tonics: a non-toxic natural substance that tone up the internal organs and improve the body functions), *Musakkin* (sedative: a substance which helps in neutralizing the heat of humour), *Muqaww-i-bāh* (aphrodisiac: an agent which strengthens the sexual organs and boosts the libido), *Muqawwi-i-Miʻda* (stomachic: an agent which strengthens the stomach and improves its function), *Kasir-i-riyaḥ* (carminative: a substance that promotes to release gases from the gastrointestinal tract)[17,18,21,23].

- *Habb-ul-gar* is an important antidote for all poisons and is used internally or externally with wine for snake bites, scorpions, and other insect bites[3,19,22,23].
- *Habb-ul-ghar* used alone or in conjunction with honey is effective in phlegmatic headache, flatulence, epilepsy, duodenal ulcer, and strengthens *Quwwat ḥāfiẓa* (faculty of memory)[3,19–21].
- 9 g powdered *Habb-ul-ghar* when ingested orally found effective in numbness, paralysis, and facial palsy[3,19,20].
- When used as ear drops, the ground *Habb-ul-ghar* in *Roghan Gul* or vinegar relieves tinnitus, deafness, and otalgia[3,16,19,21].
- Gargling with the decoction of *Habb-ul-ghar* relieves toothache[16,22].
- *Habb-ul-ghar* as linctus, mixed with honey and taken orally, is effectively used in dyspnoea, lung ulcer, chronic cough, and phlegmatic disease of the chest[3,19,20,23].
- *Habb-ul-ghar* 7 g taken with *Sikanjabīn* or honey expel viscous humours and act as purgative[19,20,23]. Moreover, it dissolves the viscous gases and is also helpful in *Maghṣ* (tenesmus), *Qūlanj* (colic), liver and spleen disorder. In another regimen, 9 g *Habb-ul-gahr* powder taken with the mucilage of *Isapghol* gives instant relief in intestinal colic[19,20,22].
- 4.5-9 g *Habb-ul-ghar* mixed with wine when given orally relieves incontinence and dribbling of micturition, helps in parturition, and also acts as an emmenagogue[3,18,19,23].
- 3.5 g of *Habb-ul-ghar*, when taken orally with water, shows a lithotriptic effect[3,16,19,23].
- In conjunction with *Sikanjabeen* (a liquid preparation made with vinegar and honey/sugar), *Habb-ul-gar* was found effective in a disease of hot temperament and, when taken with honey, gives a beneficial result in conditions of cold temperament, as advised by Dawud Antaki. He also advised to use as *Naṭul* (irrigation) for resolvent; *Ābzan* (sitz bath) for rectal and uterine diseases; *Firzaja* (pessary) for abortion and diuretics[20].
- *Roghan* (oil) of *Habb-ul-ghar* used tropically in *Dā'al-thaʻlab* (alopecia areata), *Qūbā* (ringworm), *Qatil-i-qaml* (kills the lice), *Wajaʻ al-Mafāsil* (polyarthritis), *Niqris* (gout), *Wajaʻ al-Ẓahr* (backache), *Jarab wa Ḥikka* (scabies

and pruritis), *Fālij* (hemiplegia), *Laqwa* (facial palsy), *Waja' al-kabid* (hepatic pain), *Waja' al-āsāb* (neuralgia), strengthening of muscle and found very effective.[3] It is concoctive to *Awram balghamiya* (phlegmatic inflammation) and *Muḥallil-i riyaḥ* (resolve flatus)[27].

Dose (*Miqdār-i-khorāk*): The dose of *Habb-ul-ghar* is 2-3 gm and up to 9 gm for purgation purposes[3,17,19].

Adverse effects (*Muzir*): According to Ibn Sina, *Habb-ul-ghar* induces *Qay'* (vomiting); muscle and ligament of the stomach become flaccid i.e. *Istirkha' al-mi'da* (gastroptosis)[3,19,22]. It is also harmful to the liver[17,26].

Correctives (*Musleḥ*): *Zarishk* (*Berberis vulgaris*),[3,17,19]; *Katira* (*Sterculia urens*);[21] *Tabasheer* (*Bambusa arundinacea*)[26]

Substitute (*Badal*): *Haab-ul-Mahlab* (*Prunus mahaleb*), *Badam Talkh* (*Prunus amygdalus*);[3,19] *Shooneez* (*Nigella sativa*)[17,26]; *Sazaj* (*Cinnamomum tamala*)[20]

Unani formulation

Table 2: Showing compound formulations of *Habb-ul-ghar*, dosage and indications

Name of Compound formulation and their forms	Dose and methods of administration/application	Indications
Tiryāq-i-arb'a (Majun form)	2-4.5 g, orally with lukewarm water	Epilepsy, paralysis, palpitation, intestinal colic/obstruction, anti-flatulent, antidote against poison, abortifacient, cardiac and brain tonic[28]
Tiryāq-i-fārūq (Majun form)	1 g with Khameera gaozaban ambari or Dawaul misk/ orally	Hemiplegia, facial palsy, tremor, epilepsy[29]
Tiryāq-i-samāniya (Majun form)	5 g, orally with *Arq Badiyan* or water	Hemiplegia, facial palsy, tremor, epilepsy, anti-flatulent, intestinal obstruction[29]
Tiryāq-ut-tīn (Majun form)	2-3 g, orally with water at morning	Opium poisoning, antidote to scorpion bite[30]
Tiryaq̄-i-aqrab (Majun form)	3-5 g	Scorpion bite, intestinal colic, gastralgia, visceral pain[30]
Anqardiya-e-kabeer (Majun form)	4 g, orally with milk at night	Hemiplegia, epilepsy, facial palsy, amnesia, gout, asthma, aphrodisiac, digestive tonic[29]
Dawa-ul-kibrīt (Majun form)	5g, orally	Nervine weakness, stomach weakness[30]

***Habb-ul-Ghar* (Laurel fruit) in other Traditional medicine**

In Iran, a decoction of dried fruit is taken orally as an appetite stimulant & digestive aid. In Israel, fruit essential oil is used externally on wounds, rheumatic & neuralgic pain. The dried fruit in hot water extract orally as a circulatory stimulant and externally to soften tumours and ulcers in Peru. Fruits are taken in Europe orally during childbirth to speed up delivery.[14] In India, fruit is taken orally as an emmenagogue, anti-leucorrhea, and anti-diarrheal.[6] The dried macerated fruit with Olive oil is used as antirheumatic in Italy.[14] The fruit has stimulant and narcotic properties, used for hysteria, amenorrhea, and flatulent colic; yield an aromatic fat, applied as a stimulant in sprains.[25] The aqueous extract of the *L. nobilis* fruits has been used in Turkish folk medicine as an anti-hemorrhoidal, antirheumatic, antidote in snakebites, and stomach ache[12].

DESCRIPTION OF *HABB-UL-GHAR* IN THE SCIENTIFIC LITERATURE

Taxonomical classification: kingdom: Plantae; Division: Magnoliopsida; Order: Laurels; Family: Lauraceae; Genus: Laurus; Species: nobilis[31]

Plant description: *Laurus nobilis* L. is a profusely branched shrub or a small size tree, usually grow up to height of 10 meters.

Figure 1(a): *Laurus nobilis* Plant

Figure 1(b): *Laurus nobilis* Fruit

Source: (a) https://i.pinimg.com/originals/e3/ad/77/e3ad772b24230e9fe3902ca974673925.jpg
(b) https://2.bp.blogspot.com/ePiqmmezjeE/VtRzCBfNSDI/AAAAAAAHmY/7k7_Saihugg/s1600/64253_1.

Table 3: Botanical description of *Laurus nobilis* L.[7,14,32]

Plant parts	Morphological characteristic
Bark	Smooth, thin and olive green to brown in colour
Leaves	Alternate, lanceolate, bipinnate compound, acuminate at both ends, entire, about 10 cm long, 1.7-1.8 cm wide with short 0.5 cm petiole, margins often sinuate, leathery, dark green,
Flower	Ebracteate, axillary bushy umbels or short racemose panicles, dioecious, small whitish green, 4 petals fused at base, male flower 10-12 stamens, female 4 staminodes', style short with triangular obtuse stigma
Fruit	Dried, drupaceous, ovoid 1.2-1.6 cm long, 0.6-1.0 cm wide, brownish black; outer surface is glabrous shining and coarsely wrinkled due to the shrinkage of narrow succulent region below the epidermis. At the apex, there is a small point left by the style and a small scar at the base shows the point of fruit to the thalamus. single seeded, brownish yellow and bitter in taste, kernel of the seed consists of two large planoconvex cotyledons and a small superior radicle

Microscopic feature of fruit: On sectional view, the testa shows the epidermis made up of rectangular to squarish parenchymatous cells coated with cuticle on the outer surface and most of these cells found to possess yellowish-brown contents which give test for protein. Polygonal to oval parenchymatous cells and numerous oil cells make up the several layered zones under the epidermis. The oil containing cells are oval to round, large and with slightly thickened wall. The innermost surface of testa is attached to endosperm. In endosperm, there is a single layer of radially elongated highly thick-walled cells. The parenchymatous cells of the endosperm are found highly thick-walled cells and containing yellowish brown mass. The epidermis of the cotyledon is single layered, and the cells are small, rectangular to squarish in shape and outer walls of the cells are thickened. Ground tissue is mostly composed of thin walled polygonal to oval parenchymatous cells; the cells possess numerous aleurone grains which are simple and oval to round[33].

PHYTOCHEMISTRY

The main bioactive compounds of *Habb-ul-ghar* (Laurel fruit) with a focus on their isolation and identification are listed in Table 4. *Laurus nobilis* fruits contained organic compounds viz. phenolics, steroids, glycoside, fixed and essential oil, tannins, resins, flavonoids, carbohydrates, proteins and iron, calcium, sodium, potassium, etc. phosphate as inorganic compounds[33].

Table 4: The main secondary metabolites identified from *L. nobilis* (fruit)

Chemical constituents	Analytical method	Region with reference
Monoterpenes		
1,8-Cineol (eucalyptol)	GC-MS	Bulgaria,[34] Greece,[10] Georgia,[10] Tunisia, [12] India[6] Lebanon[35]
α-pinene	GC-MS	Lebanon,[32,33] Turkey,[37,38] Bulgaria,[34] Greece,[10] Tunisia, [12] Iran,[39] India[6]
β-pinene	GC-MS	Lebanon,[32,33] Turkey,[37,38] Bulgaria,[34] Greece,[10] Iran, [39] Tunisia[12]
α-phellandrene	GC-MS	Lebanon,[36] Turkey,[37] Bulgaria,[34] Greece,[10] Iran,[39] India[6]
Sabinene	GC-MS	Lebanon,[36] Turkey,[37,38] Bulgaria,[34] Greece[10]
Limonene	GC-MS	Lebanon,[36] Bulgaria[34]
γ-terpinene	GC-MS	Lebanon,[36]Turkey,[33] Bulgaria[34]
Linalool	GC-MS	Lebanon,[31] Turkey,[33] Tunisia[12]
Camphene	GC-MS	Lebanon,[36]Turkey, [37,38] Bulgaria,[34] Greece[10]
Terpinene-4-ol	GC-MS	Lebanon,[36] Bulgaria,[34] Greece, [10] Turkey 33
α-terpineol	GC-MS	Lebanon,[36]Turkey[38]
α-terpinyl acetate	GC-MS	Bulgaria,[34] Greece,[10] Iran, [39] Tunisia,[12] Turkey[33]
Bornyl acetate	GC-MS	Bulgaria,[34] Turkey[38]
p-cymene	GC-MS	Lebanon,[36]
m-cymene	GC-MS	Turkey[38]
α-thujene	GC-MS	Turkey[37]
Myrcene	GC-MS	Lebanon,[36] Turkey[37]
(E)-β-ocimine	GC-MS	Bulgaria,[34] Georgia,[10] Turkey,[40] Tunisia, [12] Lebanon[35]
Bicyclogermacrene	GC-MS	Turkey[40]

Eugenol	GC-MS	Greece,[10] Turkey,[40] Tunisia,[12]
Methyl eugenol	GC-MS	Greece,[10] Turkey[40] Iran, [39]
Sesquiterpenes		
Germacrene – A	GC-MS	Turkey[37]
Germacrene- D	GC-MS	Turkey,[37] Georgia,[10] Greece[10]
β-elemene	GC-MS	Turkey,[37] Bulgaria,[34] Georgia,[10] Iran, [39] Lebanon[35]
β-Caryophyllene	GC-MS	Bulgaria,[34] Greece,[10] Georgia[10]
Caryophyllene oxide	HPLC	Georgia,[10] Greece,[10] Turkey[34]
Caryophylladienol I	---	Turkey[34]
Lauroxepine	IR-MS	Turkey[24]
Custunolide	IR-MS	Turkey,[24] Italy[41]
Gazaniolide	IR-MS	Turkey,[24]
Spirafolide	IR-MS	Turkey,[24]
Zaluzanin D	HPLC	Italy[41]
Eremanthin	HPLC	Italy, [41] Lebanon[35]
Santamarine	IR Spectra	Turkey,[24]
Reynosine	IR Spectra	Turkey,[24]
t-murolol	---	Turkey[38]
Dehydrocostuslactone	GC-MS	Lebanon[35]
Flavonoids		
Cynidin-3-O-glucoside	HPLC	Italy[42]
Cynidin-3-O-rutisonide	HPLC	Italy[42]
Peonidine-3-O-glucoside	HPLC	Italy[42]
3-O-rutisonide peonidine	HPLC	Italy[42]
Kaempferol	HPLC	Greece,[10] Georgia[10]
Quercetin	HPLC	Greece,[10] Georgia, Italy[42]
Apigenin	HPLC	Georgia,[10] Italy[42]
Luteolin	HPLC	Georgia,[10] Italy[42]
Fatty acids		
Lauric acid	GC	Greece,[10] Georgia,[10] Syria, Turkey[8]
Palmitic acid	GC	Greece,[10] Georgia,[10] Syria, Turkey[8]
Oleic acid	GC	Greece,[10] Georgia,[10] Syria, Turkey[8]
Linoleic acid	GC	Greece,[10] Georgia,[10] Syria, Turkey[8]
Myristic acid	GC	Greece,[10] Georgia[10]
Stearic acid	GC	Greece,[10] Georgia,[10] Turkey[8]
Arachidic acid		Turkey[8]
Butyric acid		Syria[43]
Tocopherol, Sterol		
α-tocopherol	HPLC	Greece,[10] Georgia[10]
β-tocopherol	HPLC	Greece,[10] Georgia[10]
γ-tocopherol	HPLC	Greece,[10] Georgia[10]
β-sitosterol	GC	Greece,[10] Georgia[10]
Campesterol	GC	Greece,[10] Georgia[10]

Phenolic acid		
Vanillic acid	HPLC	Greece,[10] Georgia[10]
Caffeic acid	HPLC	Georgia[10]
Syringic acid	HPLC	Georgia[10]
Ferulic acid	HPLC	Greece,[10] Georgia[10]
Cinnamic acid/ methyl cinnamate	HPLC	Greece,[10] Georgia, [10] India[6]
Carotenoids		
β-carotene	HPLC	Israel[12]
Lutein	HPLC	Israel[12]
Neoxanthin	HPLC	Israel[12]
Norisoprenoid		
6-methyl-5-hepten-2-one	GCMS	Israel[12]
Pseudoionone	GCMS	Israel[12]
β-ionone	GCMS	Israel[12]

PHARMACOLOGICAL STUDIES

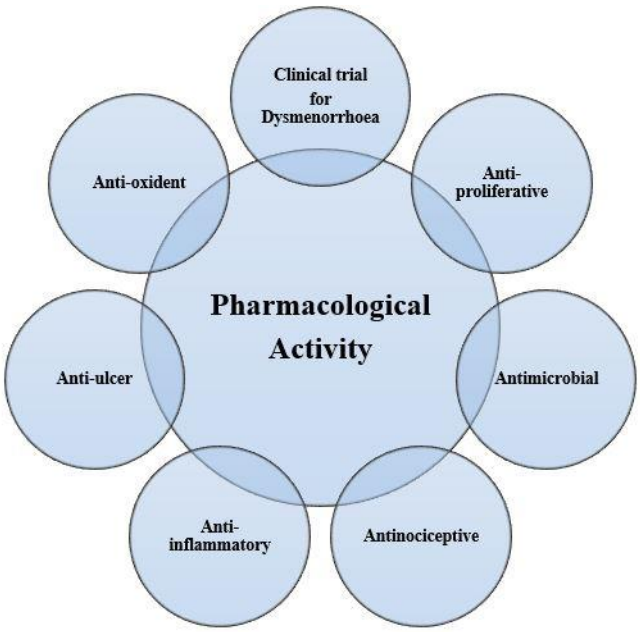

Figure 2: Pharmacological studies of *L. nobilis* fruit

Anti-ulcer activity: Crude aqueous extracts of 20 and 40% and an oily solution of the seeds of *L. nobilis* were evaluated for anti-ulcer activity. The results revealed that the crude extract and the volatile oil fraction had a gastroprotective effect with the dose of 1 ml/100 g body weight when ulcer was induced at 0.5 ml/100 g ethanol as an ulcerogenic agent. The 40% extract was able to exhibit gastroprotective action when the amount of ethanol was increased to 1 ml/100 g[44].

Antioxidant activity: The antioxidant activities of different extracts of *L. nobilis* fruit (pericarp and kernel) were performed by a DPPH assay and a β-carotene-linoleic acid assay. In the DPPH method, the highest activity (29.43%) was observed in the pericarp extract from maceration with 80% ethanol at the level of 12 µg/ml. Kernel extract obtained by Soxhlet extraction with 80% ethanol showed the most potential activity (50.78%) at the concentration of 12 µg/ml. In the β-carotene-linoleic acid method, pericarp extract of 50% methanol exhibited the strongest neutralising activity (85.56%) of free radicals, and the highest activity was observed in the kernel extract (69.93%) obtained by kinetic extraction with 80% ethanol[45].

Antioxidative activity of *Laurus nobilis* fruit methanolic extract (crude and defatted) was studied on the level of lipid peroxidation in liposomes induced by the Fe^{2+}/ascorbate system and measured spectrophotometrically by the TBA-test. The significant inhibition of lipid peroxidation was obtained after applying 2.0 mg crude methanolic extract of laurel fruit[11].

Ozcon (2010) also evaluated the antioxidant activity of the essential oil and methanolic extract of seed oil from *L. nobilis* by employing two complementary tests, namely DPPH free

radical scavenging and β-carotene/linoleic acid test. This study shows the antioxidant property of the methanolic extract of the seed oil is higher than the essential oil obtained from laurel fruits, and methyl eugenol may be considered the main contributor to this activity[46].

In another study, the essential oil from the seed of laurel fruits exhibited a scavenging effect on the DPPH radical, with IC_{50} values of 66.1±1.8 µg/ml and inhibited oxidation of linoleic acid after 30 as well as 60 min of incubation with IC_{50} of 41.1±1.2 and 45.9±1.3 µg/ml. The result was found significant ($p<0.01$) compared to ascorbic acid and propyl gallate as standard control[47].

Antiproliferative activity: Abu-Dahab et al. (2014) evaluated the antiproliferative activity of ethanol extract of the fruits on human breast adenocarcinoma (MCF7) and human ductal carcinoma (T47D), which exhibited prominent antiproliferative activity with an IC_{50} of 12.3 µg/mL for T47D cell line and 28 µg/mL for MCF7 cells. The antiproliferative activity of the extracts is attributed to the flavonoids and sesquiterpenes present in the laurel fruits[48].

Essential oil of *L. nobilis* fruit has exerted antiproliferative activity against K562 cells with IC_{50} values of 75 µg/ml. The seed oil showed a 12% erythroid differentiation at the concentration of 50 µg/ml. The result showed that seeds essential oils can inhibit the *in vitro* proliferation of K562 cells[47].

In another study, cytotoxicity was determined against A2780 human ovarian cancer cells using a microtiter plate assay, and actinomycin D was used as a positive control. The crude methanol extracts of fruits of *L. nobilis* showed the highest activity with 98% inhibition. The sesquiterpenes costunolide and zaluzanin D, which are present in the laurel fruits, are considered to be responsible for the observed cytotoxicity[24].

Antimicrobial activity: The antimicrobial activity of ethanolic crude extracts of *L. nobilis* fruit was evaluated against four Gram-positive bacteria (*Staphylococcus aureus,* methicillin-resistant *Staphylococcus aureus, Bacillus subtilis,* and *Bacillus cereus*), five Gram-negative bacteria (*Escherichia coli, Klebsiella pneumonia, Salmonella typhimurium,* and *Chromobacterium violaceum Pseudomonas aeruginosa*); four fungal species was included viz. *Aspergillus fumigatus, Aspergillus niger, Candida albicans,* and *Candida glabrata* using the agar diffusion method. The result showed a moderate zone of inhibition against all bacteria and fungi. Also, an anti-quorum sensing assay was done at the concentration of 3 mg per disc. *Chromobacterium violaceum* quorum sensing system was used for this test, and Tetracycline was used as a positive control. The quorum sensing zone of inhibition was observed 15±0.9 for the laurel fruit[49].

In another study, methanolic extract of seed oil showed significant antimicrobial activity against Gram-positive bacteria viz. S. aureus, methicillin-resistant *S. aureus, B. subtilis, E. gallinarium, L. monocytogenes,* and one Gram-negative bacteria, *H. influenza,* on agar well diffusion method[46].

The antimicrobial activity of fatty oil from *L. nobilis* fruit was evaluated with minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC) by a microtiter broth dilution method against *S. epidermidis, E. faecalis, P. aeruginosa*, *S. aureus,* and *E.* coli. The result showed that fatty oil has good antibacterial activities[50].

Antimicrobial activity of essential oil from *L. nobilis* fruits from Greece and Georgia was evaluated by agar disk diffusion and the broth microdilution method. The effects of both EOs on *Bacillus cereus*, *Staphylococcus aureus, Escherichia coli, Salmonella abony, Pseudomonas aeruginosa, Pseudomonas fluorescens* and the dimorphic yeast *Candida albicans* were evaluated. The result demonstrated low to moderate antimicrobial activity compared with the positive controls (Ciprofloxacin and Fluconazole) against all test microorganisms except *Pseudomonas* species[10].

Antinociceptive activity: *In vivo,* antinociceptive activity was carried out by 2.5% (w/v) *p*-Benzoquinone-induced writhing test in male Swiss albino mice (20-25 g) at the doses 0.1 mL/10 g of body weight. The Aspirin at 100 and 200 mg/kg doses was used as a reference drug. The ethanolic and aqueous extract of *L. nobilis* seed suspended in CMC was given orally in two doses, 250 and 500 mg/kg, 60 minutes before the induction. The number of writhes with ethanolic extract was found 35±3.3 with an inhibitory ratio of 34% at the dose of 500 mg/kg. The result demonstrated a statistically significant ($P<0.01$) antinociceptive effect[51].

Anti-inflammatory activity: The aqueous and ethanolic extract of the *L. nobilis* seed was evaluated by carrageenan (0.5 mg/25 mL) induced hind paw oedema on the male Swiss albino mice. Indomethacin (10 mg/kg of body weight) was used as standard control. The ethanolic extract of *L. nobilis* seed at 500 mg/kg doses exhibited significant ($P<0.001$) anti-inflammatory activity.[51] In another *in vivo* anti-inflammatory study, fixed oil from the *Laurus nobilis* fruit exhibit oedema with 26.33% of inhibition and found significant ($p <0.05$) results as compared to the Diclofenac standard drug. The fruits consist of flavonoids and saponins, which may be at the origin of their anti-inflammatory properties[52].

Antiviral activity:

L. nobilis fruit essential oil has been evaluated for their inhibitory activity against SARS-CoV and HSV-1 replication *in vitro* by visually scoring of the virus-induced cytopathogenic effect post-infection. The results demonstrated that fruit oil exhibited an IC_{50} value of 120 mg/ml against SARS-CoV with a selectivity index (SI; TC_{50}/IC_{50}) of 4.2. An interesting activity with an IC_{50} value of 60 mg/ml was found when fruit oil was incubated with HSV-1 virus[35].

Clinical trial: A Single-blind randomised standard controlled study for the primary dysmenorrhoea was conducted at NIUM Hospital, Bengaluru. *Habb ul Ghar* powder 4.5g was used to make a pill, and 2 pills TID with 20 ml *Maul Asal* was given to the patients for five days. Mefenamic acid 500 mg BD was used as a standard drug. The results were analysed based on visual analogue scale (VAS) and verbal multidimensional scoring system (VMSS), which was enormously significant ($p<0.001$) and almost equivalent to the standard control[53].

CONCLUSION

Laurus nobilis L., a plant of Lauraceae family, has been mentioned in the Unani system of medicine as Habb-ul-Ghar. There are several phytoconstituents in Laurus fruit that are significant components in the plant's medicinal effectiveness. Many studies have found its strong anti-inflammatory, antimicrobial, antiproliferative, anti-oxidant properties. A comprehensive research and development effort should be made to develop products for better economic and therapeutic use. Also, more clinical trials are needed to validate the therapeutic efficacy of this Unani drug.

Declaration of competing interest

There is no conflict of interest.

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