*Piper Longum*L. (*FilfilDrāz*): A Systematic Review of its Traditional and Pharmaceutical Properties in the Unani System of Medicine

ABSTRACT

The *FilfilDarāz*(*Piper longum*L.) or long pepper is native to Indo-Malaya and is widely dispersed throughout the tropical and subtropical regions. The fruits are primarily used as culinary spices and preservatives, but they are also a powerful cure in several traditional medicinal systems. Its beneficial actions are *Hāḍim*(digestive), *Kāsir-i- Riyāḥ*(carminative), and*Muqawwī-i-Mi'da*(stomachic). Since ages, Unani physicians used this herb for several disorders like *Balghamīkhānsī*(Phlegmatic cough), *Fālij*(Paralysis), *Laqwa*(Facial palsy), *Mirgi*(Epilepsy), *Niqris*(Gout), *'Irq al-Nasā*(Sciatica), and *Qūlanj*(Colitis) etc. Literature survey revealed that the plant extracts contained a variety of bioactive phytochemicals such as alkaloids, flavonoids, esters, piperine, steroids, and essential oils. The *Piper longum* was found to be antimicrobial, antiparasitic, anthelminthic, mosquito-larvicidal, anti-inflammatory, analgesic, antioxidant, anti-asthmatic, cardioprotective, anti-snake-venom neuro-pharmacological, immunomodulation, antiarthritic and antiulcer and lipidemic agents. This review covers the habit, distribution, ethnobotany, phytochemistry and pharmacology of *P. longum* in relation to its medicinal relevance and health benefits, with the goal of validating traditional claims supported by specific scientific studies. Furthermore, it examines safety and toxicity investigations, utilization of green synthesis, nanotechnology, preclinical and clinical trials to explore its medicinal importances.

Keywords: Piper longum, FilfilDrāz, piperlongumine, piperine, long pepper.

1. INTRODUCTION

India has a wide range of meteorological conditions and seasons that are ideal for the growth of several plant species. Mostly found in tropical climates, the Piperaceae family consists of 12 genera and about 1400 species, more than 700 different species are found in tropical and subtropical rain forests. Economically significant and prominent among the medicinal plants used in various systems of medicine are the piper species produced in South India. The Sanskrit word "Pippali" was the source of the Greek name "Peperi," the Latin "Piper," and the English "Pepper" [1]. Known as the "backbone of the traditional medical system," medicinal plants are used to treat a variety of illnesses by more than 3.3 billion people in under developed nations. Hippocrates, first of all described *Piper longum*, plant as a remedy rather than a spice. The fruits (*FilfilDrāz*/*Pippali*) and roots (*Pippalimūl*) of this shrub are mostly used. This plants primary applications in Europe during the Middle Ages and the 19th century were as spices and as a drug. Piper longum fruits have been used as a flavouring and preservation in pickles, food, medicines, and traditional beverages since ancient times. It is an aromatic climber that may be found around the world in tropical and subtropical climes [2]. Unani medicine claims that the fruit has a strong, and bitter flavour. It is used as *Kāsir-i- Riyāḥ* (carminative), *Muqawwī-i-Kabid* (liver tonic), *Muqawwī-i-'Ām* (general tonic), *Muqawwī-i-Mi'da* (stomachic), *Muqawwī-i-Bāh* (aphrodisiac), *Hāḍim* (digestive), *Musqiṭ-i-Janīn* (abortifacient), *Mudirr-i-Bawl* (diuretic) and *Mudirr-i-Ḥayḍ*(emmenagogue) agent. It is found to be helpful in liver inflammation, joints pain, lumbago, snake bite, scorpion bite and night blindness [3].

In Ayurveda, unripe fruit is considered to be pleasant and cooling, as well as beneficial for biliousness. The ripe fruits are sweetish, pungent, *Muqawwī* (tonic), *Muqawwī-i-Mi'da* (stomachic) and *Mulayyin* (laxative) in nature and are generally used in asthma, *Baraṣ* (vitiligo), tumours, *Bawāsīr* (haemorrhoids), spleen disorder, for strengthening cognition, insomnia,

jaundice, *Ishāl* (diarrhoea), hiccups, anaemia, dysentery, pain and inflammation. The role of fruit milk extract is established and showed effective decline of passive cutaneous anaphylaxis in rats and also protects against antigen-induced bronchospasm in guinea pigs [4].
The root of the pepper plant (Piper longum L.), is used to treat a variety of conditions, including tumours, spleen illnesses, bronchitis, abdominal pain, ascites, palsy, gout, and lumbago. It is also used as a carminative, hepato-protective, stomachic, abortifacient, haematinic, diuretic, digestive, and stomachic [1,3].Integrating traditional knowledge of medicinal plants with conventional treatment is crucial for meeting healthcare requirements. Oil components of the herb have been reported to inhibit the rise in triton induced serum total cholesterol in mice. Likewise, the antifertility activity is also documented with the use of powder of root [4].

2. MATERIAL AND METHODS

We conducted this review utilizing all available textual, digital, and online resources. Both modern and Unani texts were studied for their descriptions, identification, temperament, pharmacological investigations, effects, medicinal applications, and so on. Published publications and research papers were searched in Science Direct, PubMed, Google Scholar, Scopus, and other sources. Additional information regarding the item was found using the keywords *FilfilDrāz*, *Piper longum*, Pippali, Long pepper, and Piperine. The Standard Unani Medical Terminology, produced by the Central Council for Research in the Unani System of Medicine in partnership with the World Health Organization, offered the necessary Unani terminologyand WHO international standard terminologies on Unani medicine.

3. RESULTS AND DISCUSSION

3.1 Botanical description

It is a tiny, scented climber that is a member of the *Piperaceae* family. The plant's roots are woody, wide oval, and have cordate leaves. The creeping, joined, and thickened nodes of the stem. The leaf blades have a wide range in size, are alternating, spreading, and stipule-free. The leaves range in size from 5-7 cm at the bottom to 2-3 cm at the top. Flowers have single, cylindrical spikes. The fruits are small, blunt, oblong, blackish-brown and measuring 2.5–3.5 cm in length and 5 mm in breadth (Fig.1). They are borne on fleshy spikes [2]. The mature spikes are harvested and dried to create *pippali*, which is also sold as *pippalimula*, the root radix. *Piplamul* comes in three different grades, with grade I having the thickest roots and underground stems commanding the highest price and grades II or III having the thinnest roots, stems, or shattered fragments. The transversely sliced, cylindrical, straight, or slightly curved pieces that make up the commercial medication are virtually exclusively between 5 to 25 mm in length and 2 to 7 mm in diameter. Some of the pieces have prominent, swelling internodes that show a variety of leaf and rootlet scars. The exterior is a soiled light brown colour. The medicine has an odd smell and a bitter, acrid taste that makes the tongue numb [5].

3.2 Scientific classification

Kingdom	: Plantae
Subkingdom	: Tracheobionta
Super division	: Spermatophyta
Division	: Magnoliophyta
Class	: Magnoliopsida
Subclass	: Magnoliidae
Order	: Piperales
Family	: *Piperaceae*
Genus	: *Piper*
Species	: *Longum*[5,6]

3.3Habit and habitat

India is the country of origin for several herbal medications that are used to treat a variety of diseases. It is a significant medicinal plant utilised in traditional Asian and Pacific Islander remedies. The genus is thought to have 700 species worldwide, with about 30 species documented in India. It is primarily grown in regions with considerable rainfall, limestone soil, and high humidity. Plant is found throughout the hotter parts of India from Central to the North-Eastern Himalayas. In Odisha it is found in Koraput, Ganjam, Phulbani, Kalahandi, Khurda, Keonjhar, Mayurbhanj, Puri, Angul. *Piper longum*is distributed throughout tropical and subtropical regions of the world. In India, the plant is found in the lower hills of West Bengal, the Khasi hills, the Mikir hills, the evergreen forests of the Western Ghats from Konkan to Kerala, and the Nicobar Islands. It is also found in Assam, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Maharashtra, Kerala, and Karnataka.

Most of the world's tropical rainforests, including those in Nepal, India, Indonesia, Malaysia, Sri Lanka, Bhutan, Philippines, and Timor, include the plant [2,7].

3.4Cultivation and collection

Indian the majority of long pepper comes from wild plants, and the main supply regions are Assam, West Bengal, and Uttar Pradesh. The species has become extremely scarce in Keralan forests as a result of the plants over extraction from their natural habitat. Long pepper prefers shady, wet circumstances, well-drained sandy soil with a pH range of 5.5 to 8.5, and rich humus. It is generally found in tropical, humid climates. It is grown in Andhra Pradesh, Tamil Nadu, and Assam. *Piper longum* is extensively grown in limestone soil in regions with high rainfall and relative humidity. Kerala's mountainous hills provide successful growing grounds for the *piper longum* plant. It is a shade-loving plant; however, 50% shade is ideal for better fruiting. It thrives under the shadow of trees in regions with lots of rainfall and may also be grown as an intercrop in coconut plantations on the lowlands, though it is advised to grow it between 900 and 1500 meters above sea level [7,8]. After six months from the time of planting, vines are ready for their first harvest. Two months after the spikes develop on the plants, they are ready for harvest. When spikes are most aromatic and blackish green, they are harvested. For four to five days in the sun, the gathered spikes are dried until they are completely dry [1].

Fig. 1: *Filfil Drāz*(fruits of *Piper longum*Linn.)

3.5 Description in Unani literature

Dār-i-Filfil (*Piper longum*) is climber and its fruits are cylindrical in shape (thick in the middle and pointed at the edges) three meters or less in length. They have pimple-like bumps on their outer surface. Its fruits and roots are used medicinally. The leaves of which are like betel (*Piper betel*) leaves but equal to the leaves of *lobia*/*Farīqa* (*Vigna unguiculata*), their taste is sharp and bitter،its branches have knots on which a leaf emerges,At the root of each leaf is a green *pepper* like a raw mulberry and it is smaller than mulberry and turns black after drying,it contains small and combined grains like *Rai/Khardal* (*Brassica nigra*),these grains have a thin membrane over them and between the grains there are black membranes. The taste of *pepper* is very sharp, slightly bitter and burning sensation. Its bark is more bitter and pungent than the seeds. Its root has nodules and produces fine fibers the bark of the root is leathery and its pulp is white fibrous and has a strong taste. According to *Jalinūs* (Galen), the first thing that comes out of the pepper tree is this fruit and then the *black pepper* comes out,if it is broken after it is fully ripe, then it is called black pepper, and if it is broken before it is ripe, then it is called white pepper. In *Sharh-i-Qanun*, Hakim Ali Gilani stated that studies have shown that *long pepper* trees are currently as large as mulberry trees.According to Sharif Khan the *long pepper* is inside the pod which is like a *Lobia* pod. According to *Shaikh* (Ibn-Sina),*Dār-i-Filfil* is the first fruit of the pepper.Some people say that *Dār-i-filfil* is the bud of white pepper. A well-stuffed and unadulterated pepper is best it is excellent and insoluble in water, and its pungent taste is quite similar to that of pepper [7,8,9,9,10,11].

3.5.1 *Mutrādifāt* (Vernacular names)

Arabic	:Dār-i-Filfil[9,11,12,13,14]
Ayurveda	:Pippali, Chapalaa, Krishna Kola [4]
Bengali	:Pīplamor[15]Pipli[12]
Chinese	:Pi Po [16]
Deccan	:Pīppli, Pipulmul[16]
English	:Indian Long Pepper, Jaborandi [4] Long Pepper [10,12,17]
German	:Langer, Pfeffer [16]
Gujrati	:Pīpal, Pīpli, Pipara[18]
Hindi	:Gazpīpal, Pīper, Pīpal[17]

Kannada	:Hipli[15]
Malayalam	:Maghadi, Mulagu, Tippali[6]PippaliChopala[17]
Marathi	:Pimpli[6]
Persian	:FilfilDarāz[10,11,12,14] Filfildray, Pīpal[18]
Punjabi	:Maghaan[12]
Sanskrit	:Chanchala, Granthika, Krishnapippali[16]Pippali[18]
Sindhi	:Pīri[12] Fil, Fildray[18]
Tamil	:Argadi, Kolagam, Kalidi[17]Tippali, Pippili[15]Pippli[13]
Telugu	:Modi, Pippali, Pippallu[17]
Urdu	:Pīpal[13]
Uriya	:Krykola, Mogodha, Pippoli[16]
Unani	:FilfilDārāz[17] Dār-i-Filfil[4]PeperiMakron[16]

3.5.2 *Ajzā-i-Mustaʻmalā* (Parts used)

Different parts of *Filfildarāz*(*Piper longum*L.) used for the medicinal purpose are

- Root [17]
- Fruits [17]

3.5.3 *Mizāj* (Temperament)

The temperament of *FilfilDāraz*(*Piper longum*L.) given by different Unani scholars in literature are-

- *Hār*2^0*waYābis* 2^0 (Hot 2^0 and dry 2^0) [9,12,19,17]
- *Hār* 0^0*waYābis* 0^0 (Hot 0^0 and dry 0^0) [10,20]
- *Hār* 3^0*waYābis* 2^0 (Hot 3^0 and dry 2^0) [21,22]

3.5.4 *Afʻāl* (Pharmacological action)

Long Pepper has *Haḍim* (Digestive), *Idrār-i-Bawl* (Diuretic), *Muhallil* (Resolvent), *Muqawwī-i-Miʻda* (Stomachich), *Kāsir-i-Riyāh* (Carminative), *Muḥarrik* (Stimulants), *Musakhkhin* (Calorific), *Muqawwī-i-Bah* (Aphrodisiac), *Musqit-i-Janīn* (Abortifacient), *Mudirr-i-Hayḍ* (Emmenagogue), *Musaffī-i-Dam* (Blood purifier), *Mufattih* (Deobstruent), *Daʼf-i-Qai* (Anti-emetic), *Mughalliz-i-Manī* (Increase viscosity of semen), etc. properties [9,10,11,12,17,19,23].

3.5.5 *Isti ʻmālāt* (Therapeutic uses)

It is used for the treatment of *Amrāḍ-i-Jigar* (Liver disorders), *Amrāḍ-i-Miʻda* (Stomach disorders), *Waja‘ al-Shikam* (Abdominal pain), *Nafkh al-Shikam* (Flatulence), *Suʻāl-i-Balghamī* (Phlegmatic cough), *Ḍīq al-Nafas/Dama/NafasḌayyiq* (Bronchial asthma), *Waja‘ al-Mafāṣil* (Polyarthritis), *Niqris* (Gout), *ʻIrq al-Nasā* (Sciatica), *Amrād-i-Balghamī* (Phlegmatic disorders), *AmrāḍSawdāwiyya* (Diseases of melancholic humour), *Shabkorī/ʻAshā'* (Night blindness/Nyctalopia), *Gazīdgī-i-ʻAqrab* (Scorpion bite), *Fālij* (Paralysis), *Laqwa* (Facial palsy), *Ṣarʻ* (*Mirgī*) (Epilepsy),*Iʻyā'ī* (Fatigue), *Amrād-i-Dimāghī* (Brain disorders), *Waramal-Ṭiḥāl* (Splenitis), *Judhām / Al-ʻIlla al-Kubrā* (Leprosy), *Istisqā'* (Oedema), *Jarayān* (Spermatorrhoea), *Mulayyin* (Laxative), *Suʻāl* (Cough), *Duʻf al-Ishtiha'* (Anorexia) [9,10,11,12,17,19,23].

3.5.6 *Tarkīb-i-Isti'mal*(Mode of administration)

3.5.6.1 Amrāḍ-i-Raʼs-o-Niẓām-i-Aʻṣāb-o-Dimāgh (diseases of head and nervous system)

- Grind the *Piper longum* with water and apply on fore head to relieve headache [11].
- *Piper longum* powder can be inhaled through the nose to treat cold headaches [11].
- Powder of *Piper longum*, *Piper nigrum*, and *Zingiberofficinale* is useful in the numbness of hand, feet and weakness are eliminated by licking the powder [11].

3.5.6.2 Amrāḍ-i-ʻAyn (diseases of eye)

- By grinding the *Piper longum* and applying it to the eye will resolve corneal opacity and also gives benefit in night blindness [11].

3.5.6.3 Amrāḍ-i-ʻIẓām-o-Mafāṣil (diseases of bones and joints)

- If the *piper longum* is mixed with *Zaft/Qatran/Coal tar* and applied topically, it dissolves the scrofula, and if it is used mixed with *Natrūn*, it is eliminated *Bahaq* (Pityriasis) [23].
- Oil prepared with *Piper longum* and *Zingiberofficinale* is used locally to cure gout [11].

3.5.6.4 Amrāḍ-i-Niswān-o-Qabālāt (diseases of gynaecology and obstetrics)

- Licking the *Piper longum* with honey increases digestion, brings more urine, removes menstrual bleeding if it comes from obstruction [11].
- *Piper longum* powder combined with ghee is used to licked, it stops post-partum haemorrhage[11].
- *Piper longum* powder is taken with lukewarm milk to increases milk production [11].

3.5.6.5 Amrāḍ-i-Niẓām-i-Tanaffus (diseases of respiratory system)

- To clear the throat, the mixture of *Piper longum* powder with honey is used to lick [11].
- If the *piper longum* is mixed with honey and applied on the neck, it is useful for diphtheria [23].

3.5.6.6 Amrāḍ-i-Litha-o-Dandān (diseases of gums and teeth)

- To cure toothache, keep its powder combined with ghee and honey in the mouth [11].

3.5.6.7 Amrāḍ-i-Niẓām-i-Haḍm (diseases of digestive system)

- A large amount of pepper induces urination while a small amount causes diarrhoea[23].
- *Piper longum* juice by adding ghee and milk and heating it before feeding improves stomach ailments and appetite [11].
- In buttermilk, pipal powder dissolves when added honey and used to feed splenomegaly [11].

3.5.7*Maḍarrat* (harmful effects)

- *Ṣudā'* (*Headache*) [9,10,11,12]
- *Kabid* (Liver) [11]

3.5.8*Muslih* (corrective)

- *Babūl Gond* (*Acacia arabica*), *Sandal* (*Santalum alba*), *Gulab* (*Rosa damascena*) [9,11,12,17]*Shakar* (Sugar) [10]
- Toxic effect for Liver *Zarishk* (*Berberis vulgaris*) and *Aspaghol* (*Plantago ovata*) [11]

3.5.9*Badal* (substitute)

FilfilSafaid (*Piper longum*), *Zanjabīl* (*Zingiberofficinale*), *Zaranbād* (*Zingiber zerumbet*) [9,10,11,12,17], *Khulanjān* (*Alpiniagalanga*) [10,11]

3.5.10Contraindication

It is not recommended for liver diseases, according to Unani physicians. Additionally, it is advisable to avoid it during headaches [11].

3.5.11*Miqdār-i-Khūrāk* (Therapeutic dose)

The mentioned therapeutic doses in various unaniclassical textbooks are as follows:
- about 4.5 g [9]
- 1.75-4.5 g [10,11]
- up to 5 g [17]

3.5.12*Murakkabāt* (Compound formulations)

Dār-i-Filfil /FilfilDrāz (fruits of Piper longum Linn.) is one of the most ingredient used in the preparation of various compound formulations in the Unani system of medicine (Table 1).

3.6 Phytochemical constituents

Alkaloids are widely distributed in the plant, along with other associated substances such volatile oils, starches, gums, resins, fatty oils, and inorganic debris. There have previously been reports of more than 50 different alkaloids from this plant. The plant contains significant amounts of lignans and esters, such as sesamin, tridecyldihydro-pcousmarate, etc. Three main substances, namely caryophyllene (17%), pentadecane (15.8%), and 6bisabolene (11.2%), make up the essential oil found in fruits. The fruit contains a variety of alkaloids and related substances, with piperine being the most prevalent. Other alkaloids and related compounds found in the fruit include methyl piperine, pipernonaline, piperettine, asarinine, pellitorine, piperundecalidine, piperlongumine, and piperlonguminine, as well as retrofractamide A, pergumidiene, brachystamide-B, a dimer of desmeth. The root contains the compounds piperine, tetrahydropiperlongumine, trimethoxy cinnamoyl-piperidine, and piperlonguminine. 1-(3-,4-methylenedioxyphenyl)-1E-tetradecene and 3-(3-,4-methylenedioxyphenyl) are recently discovered chemical components, piperic acid, propenal 3 ,4 -di-hydroxy-bisabola 1, 10, and eudesmic-4 (15) 6-alpha-diol, 7-epi-eudesm-4, and -ene1beta (15) guineesine, ene-1beta, 6beta-diol, and 2E,4E dienamide (2E, 4E, 8E) 2,4,8-trienamide of nisobutyl. Sesamin, pluviatilol, and fargesin are the three primary lignans found in the fruits. The fruits include Z-12 octadecenoicglycerol monoester, and tridecyl-dihydro-p-coumarate. Tetrahydropiperic acid (THPA) and palmitic acid are the two main organic acids found [6,29,30].

3.7 Scientific studies

Scientifically validated studies of *FilfilDrāz*(*Piper longum*L.) are as follows;

3.7.1 Antioxidant and Antimycobacterial Activity

Invitro antioxidant and antimycobacterial activity of extracts of Piper longum (PC) seeds made from chloroform, ethyl acetate, hexane, ethanol, hydro-ethanol, and water. In order to verify the folklore claims about the extract effectiveness against non-tuberculous bacteria, the extracts were also tested for antimycobacterial properties against *Mycobacterium smegmatis*. The Minimum Inhibitory Concentrations (MICs) of PC, PH, PE, and PEA were determined to be 8, 16, 16 and 32 mg/mL, respectively, and Minimum Bactericidal Concentration (MBC) were calculated to be 20.23, 33.43, 36.23, and 64.09 mg/mL, respectively. The highest in vitro antioxidant activity as well as antimycobacterial activity was found in PC chloroform extract [31].

Table1: Compound preparations containing *Piper longum* Linn

S. N.	Compound formulation	Dose	Action and uses
1.	Habb-i-Bīsh	150 mg	Nervine tonic, analgesic, its used for weakness of nerve and hysteria [24].
2.	Habb-i-Kibrīt-i-Kabīr	250-500 mg	Digestion, antiseptic, epidemic, helps in dyspepsia and diarrhoea with vomiting [24].
3.	Habb-i-Nārmushk	250 mg to 1 g	Purgative, carminative, its used in intestinal colitis gastralgia [24].
4.	Kohal-i-Asha	For ophthalmic use	It's used in eye diseases [24].
5.	Kohal-i-BāsaliqūnKabīr	For ophthalmic use	Resolvent, helps in eye disease [24].
6.	Kohal-i-Kāfūr	For ophthalmic use	Resolvent, it's used in conjunctivitis [24].
7.	Burūd-i-Hasram	For ophthalmic use	Repellent constipation, helps in eye diseases [24].
8.	Ma'jūn-i-Bhangra	10-20 g	Carminative, used in flatulence [24].
9.	Ma'jūn-i-Misri	5-10 g	Aphrodisiac, nervine tonic, its used in anaphrodisiac and weakness of nerve [24].
10.	Ma'jūn-i-Yahya Bin Khālid	5 g	Resolvent, analgesic, helps in gout and arthralgia [24].
11.	JawārishKāfūr	5-10 g	Stomachic, carminative, its used in dyspepsia, perverted digestion and flatulence [24].

12.	JawārishSafarjaliMushil	5-10 g	Digestion, analgesic, its used in colitis and anorexia [24].
13.	JawārishZar'ūni Ambari	5 g	Strengthen of bladder, kidneys and liver, helps in incontinence of urine, headache, gout and chronic kidney diseases [24].
14.	ItrīfalMuqawwī-i-Basar	5-10 g	Carminative, analgesic, liver tonic, its used in flatulence, gastralgia and perverted digestion [24].
15.	Halwa-i-Suparipāk	10-20 g	Semen inspissant, aphrodisiac, semen retentive, helps in spermatorrhoea and anaphrodisiac [24].
16.	Sadri	3 g with lukewarm water twice a day	Broncho-relaxant, expectorant, its used in cough and asthma [25].
17.	Shababi	6 g twice a day	General tonic, strengthen of aphrodisiac and nerve, helps in weakness of nerve and aphrodisiac [25].
18.	Sharbat-i-Faulād	Adult–20 ml, Child–10 ml twice a day	Blood producing, strengthen of stomach and liver [25].
19.	Habb-i-Rādi'	Ophthalmic use	Resolvent, helps in repellent [26].
20.	JawārishNārmushkMushil	3-5 g	Carminative, its used in flatulence and colitis [26].
21.	JawārishAnjadān	5-10 g	Deobstruent, carminative, anti-acidity, helps in colitis, flatulence [26].
22.	BarūdBanafshāji	For ophthalmic use	Eye tonic, its used in epiphora, itching of eye and weakness of eyes [26].
23.	Roghan Hindi	For local use	Nervine tonic and stimulant of nerves, its used in ball's palsy and tremors [26].
24.	ItrīfalKabīr	7 g with 'ArqGaozabān 10 tola at the bedtime	Strengthen of stomach, brain, eyes and aphrodisiac, its used in haemorrhoids and weakness of eyes and brain [27].
25.	Anqrūya-i-Kabīr	4 g with 'ArqBādiyān 12 tola before breakfast	Aphrodisiac, digestion, it helps in paralysis, bell's palsy, epilepsy and dementia [27].
26.	BāsaliqūnKabīr	Used as Surma at bedtime	Cataract, itching of eye, weakness of eye [27]
27.	JawārishBasbasah	7 g with 'ArqBādiyān in the morning & evening	Resolving of flatulence, digestion, its used in haemorrhoids and flatulence [27].
28.	JawārishSafarjaliMushil	7 g use with 'ArqBādiyan	Stomachic, digestive, helps in dysentery, colitis and stomach pain [27].
29.	JawārishFalafali	3 g use with 'ArqBādiyān	It is used in stomach pain and flatulence [27].
30.	Habb-i-Azarāqi	One pill uses with 'ArqBādiyān and 'ArqGaozabān 60 ml	Nervine tonic, helps in phlegmatic disorders [27].
31.	Habb-i-TurshMushtahi	Two pills use after	Stomachic, digestion, appetizer,

		meals	it is used in accumulation of thick gas in elementary canal [27].
32.	KohalByaz	Kohl	It is used in cataract, pterygium [27].
33.	Ma'jūn-i-Alkali	12 g use with milk	It is beneficially for strengthening the kidneys, bladder and aphrodisiac [27].
34.	Ma'jūn-i-Sa'lab	7-12 g use with milk in the morning	These are beneficially for aphrodisiac and strengthen nerves, helps in spermatorrhoea[27].
35.	MufarrihMu'tadil	9 g use in the morning	Strengthen of heart, brain, liver and appetizer, helps in uterine disorders and diarrhoea[27].
36.	Habb-i-Shītraj	Two dirhams with warm water	It is beneficial in paralysis, bel's palsy, arthritis and menorrhagia [28]
37.	JawārishUtraj	Two dirhams	Appetizer, resolving of flatulence and strengthen of stomach [28].
38.	Jawārish Amber	4.5 g	Indigestion, palpitation and uterine pain, and it's beneficial for old age [28].
39.	JawārishFalafali	One dirham (3.5 g) with warm water.	Stomach pain, coldness of stomach and liver, excessive phlegm and humours, resolvent of flatulence [28].
40.	Ma'jūn Pudina	Two dirhams	Digestion and resolving of flatulence [28].
41.	Ma'jūnHabb-ul-Nīl	6-7 dirhams	Evacuate of morbid humours of body [28]
42.	Dawa-ul-Buzūr	Five dirhams in the morning and evening	More effective of aphrodisiac [28]

3.7.2 Antiviral Activities and Cytotoxicity Assay

Here, we draw the conclusion that, when compared to other extracts of both *Piper nigrum* and *P. longum*, the chloroform extract of *P. nigrum* has the highest activity. This can be because there are more alkaloids present than usual. The MTT or (3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyl tetrazolium bromide) experiment that we performed supported the aforementioned finding by demonstrating a lower lethal dosage for 50% death. Finally, we draw the conclusion that the alkaloids found in the chloroform extract are what cause the aforementioned effects [32].

3.7.3 Hepatoprotective activity

The research conducted by Patel and Shah (2009), the hepatoprotective properties of *Piper longum* milk extract. To cause the chronic reversible type of liver necrosis, carbon tetrachloride (CCl4) was administered as a hepatotoxin at a dose of 0.5 ml/kg per orally with olive oil (1:1) three times each week for 21 days. A significant hepatoprotective effect was seen in CCl4-induced liver damage after treatment with *Piper longum* milk extract (200 mg/day per orally for 21 days). *Piper longum* hepatoprotective effects are equivalent to those of the commonly prescribed medication silymarin (25 mg/kg/day per orally for 21 days). The findings of the current investigation showed that *Piper longum* milk extract significantly hepatoprotective and antioxidant properties [33].

3.7.4 Anti-Rheumatoid Activity

In rats with Freund's Adjuvant Induced Arthritis, an aqueous extract of the *Piper longum* fruit was examined for its anti-rheumatoid action at doses of 200 and 400 mg/kg p. o. On the fourth, 18th, 14th, and 21st day following sub-plantar administration of complete Freund's adjuvant, the administration of extract reported a significant reduction in paw swelling. A digital Plethysmometer was used to measure the volume displacement of the paw oedema. According to the findings of the current study, the aqueous extract of *P. longum* exhibits potential anti-arthritic efficacy in the complete Freund's Adjuvant model [34].

3.7.5 Anti-inflammatory activity

The purpose of this study was assessing the anti-inflammatory properties of two *Pippali* types in albino rats used in acute and sub-acute experimental models of inflammation. Animals that were chosen at random were divided into four groups, six animals in each. Oral administration of 200 mg/kg of the test drug was used, and in both models, the activity was compared with normal anti-inflammatory drug therapy. Between the two distinct test samples analysed, it was discovered that the Badi variation of pippali only inhibited acute phase inflammation, whereas the Chhoti type of pippali lowered both acute and subacute phase inflammation. Therefore, the Chhoti variant of Pippali may be preferred above the Badi variety in terms of medicinal value [35].

3.7.6 Spermicidal activity

This research was done to evaluate the spermicidal effects of hexane extract from *Piper longum* Linn fruits. According to studies on sperm immobilization, 20 mg/mL of hexane extract can totally immobilize sperm within 20 seconds. The sperm revival test demonstrated that the effects were spermicidal since the effect of sperm immobilization was permanent. Additionally, the treatment group's sperm viability was significantly lower than the control groups. These sperms' hypo-osmotic swelling was dramatically decreased, suggesting that the hexane extract may likely harm the sperm plasma membrane. Therefore, our investigation demonstrated that *P. longum* hexane extract has potential spermicidal contraceptive action [36].

3.7.7 Antifertility activity

Female rats were used as test subjects to determine whether the crude extract, its various fractions, and the main pure chemical from the active fraction of the powdered fruits of Piper longum had an antifertility effect. Days 1–7 post-coitum (p.c.) schedule showed 100 and 86% efficacy for the crude extract and its hexane fraction, respectively. The 1-butanol soluble, 1-butanol insoluble, and chloroform fractions, on the other hand, exhibited no activity [37].

3.7.8 Anti-Asthmatic Activity

Most asthma medications are steroidal in nature. The *Piper longum* fruit extract underwent phytochemical examination, which revealed the presence of alkaloids, steroids, glycosides, flavonoids, and carbohydrates. With the exception of alcoholic extract in milk-induced leukocytosis, the PF, AF, and DF are efficacious in all asthma models in the sequence of PF>AF>DF. Thus, it can be inferred that the Plant Piper longum is reputed to have anti-asthmatic properties [38].

3.7.9 Antidiabetic and Antihyperlipidemic Activity

According to the current investigation, oil from *Piper longum* (PLO) demonstrated significant promise in the management of hyper-lipidaemia and diabetic mellitus. Diabetes mellitus and hyper-lipidaemia may both be caused by the inhibition of a-glucosidase, aldose reductase (AR), and pancreatic lipase, respectively. This study shows that the PLO can be used as a natural source for effects that are antihyperlipidemic and antidiabetic. However, because preclinical and clinical beings share many structural similarities, the study was conducted at the preclinical level and using in vitro techniques that may be useful for clinical application. Furthermore, the researchers might carry out the clinical examination [39].

4.Conclusion

Modern science lacks a cure for many unique diseases, creating a desire for alternative treatments worldwide. Alternative and traditional medicine have significant promise for disease management due to their high efficacy, safety, and cost benefits. Now is the time to capitalize on them. There are maximum Unani formulations that use *P. longum* as a key ingredient. This research highlights the widespread use of *P. longum* in Unani medicine, especially for respiratory and neurological diseases. In traditional medicine, the plant is used to treat a variety of ailments, including epilepsy, pleural effusion, spleen disorders, dementia, diarrhoea, dysentery, and sleeplessness. The *P. longum* plant has been reported to have pharmacological actions such as antiulcer, anti-inflammatory, anticancer, neuroprotective, and others. Still, the plant requires further attention from researchers because the data on its pharmacological qualities has not been well investigated. According to the literature, this plant promises to treat a variety of ailments, although there is no recorded data to support its efficacy. As a result, further experimental and clinical research is needed to examine the mechanism of action of plant extracts in the animal body in order to demonstrate the plant's major effects in treating a variety of ailments.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

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