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Filfil Siyāh (Piper nigrum): Medicinal importance in perspective of Unani medicine and pharmacological studies

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Abstract

Piper nigrum is a perennial climbing shrub from Piperaceae family. *Piper nigrum* is native of the Indo-Malaysian region. Fruits of the *piper (Filfil Siyāh)* are used in Unani Medicine for the treatment of asthma, dyspepsia, piles, flatulence, skin diseases, respiratory diseases, toothache, fevers, and leukoderma. It is also used as carminative, liver and Gastric tonic, aphrodisiac, expectorant, emmenagogue etc. A variety of phytoconstituent are isolated from *Filfil Siyāh* which include alkaloids, essential oils, fats, safrol, tannic acid, amids etc. Various pharmacological studies on the plant have been done like antimicrobial, hepatoprotective, antidepressant, digestive etc. The aim of the paper is to highlight the therapeutic applications as per description in Unani literature and scientific studies done on *Piper nigrum*.

Keywords: Filfil Siyah, Black piper, *Piper nigrum*, Muqawwi-i-Mi'da, Respiratory diseases, Unani Medicine

Introduction

The vast diversity found in the plant kingdom may provide a fresh source of additional compounds with important therapeutic benefits, *Filfil Siyāh* is one among them ^[1]. There are about 1000 species of Piper; the most significant are *Piper nigrum*, *Piper longum* and *Piper betel* ^[2]. *Piper nigrum* is commonly known as 'Black pepper' ^[3]. It is a tropical perennial climbing vine which grows on trees, poles or other forms of support to about 20 feet high ^[4]. The plant is indigenous to Malabar and Travancore coasts, i.e. Western coast of India ^[5]. This plant is a member of Piperaceae family. It is commonly known as *Filfil Siyāh* in Unani medicine. Piper is native of the Indo Malaysia region, cultivated in Western Ghats, Karnataka, Maharashtra, Assam and Kerala ^[6]. *Piper nigrum* is a flowering vine, cultivated for its fruit, which is usually dried and used as a spice, popularly known as 'King of spices' ^[7]. It is extensively cultivated in South India and elsewhere in tropical regions. The pepper plant is a perennial woody vine growing to 4 m in height on supporting trees, poles, or trellises, it is spreading vine, rooting readily where trailing stems touch the ground. The leaves are alternate, entire, 5-10 cm long and 3-6 cm broad. The flowers are small, produced on pendulous spikes 4-8 cm long at the leaf nodes, the spikes lengthening to 7-15 cm as the fruit matures. The fruit, known as a peppercorn when dried, is a small drupe 5 mm in diameter, dark red when fully mature, containing a single seed. Dried ground pepper is one of the most common spices in European cuisine and are known, prized since antiquity for both its flavour and its use as a medicine. The spiciness of black pepper is due to the chemical Piperine ^[8]. The alkaloid Piperine is reported to show anti-bacterial activity against *Pseudomonas aeruginosa* and *Alcaligenes F 2518*. The aqueous extract of roasted black piper is reported to show cholinomimetic effects on rat blood pressure, rat jejunum and frog abdominal muscles. Black pepper contains safrol, and tannic acid which are reported to show weak carcinogenic activity in mice as compared to the control carcinogen. It contains a number of amides (like piperamide-C7) ^[9] volatile essential oils, and fats. The mesocarp contains chavicin, balsamic volatile oil, starch, lignin, gums, fat, proteins and ash containing organic matter ^[5].

Methods

All available classical Unani books e.g. Al-Jami' Li Mufradat al-Advia wal Aghzia, Khazainul Advia, Muhit Azam, Makhzanul Mufradat, Bustanul Mufradat etc. were searched for the

literature review. Additionally, Google scholar, Research Gate and PubMed were also searched using the keyword's *Filfil Siyāh*, Black piper etc. Review articles, Clinical trials, and experimental studies were taken into consideration for data generation and analysis.

Observations

Geographical Distribution: Black pepper is found in many tropical countries, including Brazil, Indonesia, and India [10]. Its geographic range is limited to South India's Western-Ghats [11]. However, there are other reports of cultivation from the west-indies, Malaysia, Indonesia, Brazil, and Sri-Lanka [12].

Botanical description

Black pepper is a perennial climbing vine that grows well in the shadow under trees or other supporting structures (Fig. 1 a. & b.). The woody climbers that are glabrous can reach a height of 10 meters or more. The mature stem of the black pepper plant has 10-20 primary adventitious roots that grows from it. The vines are grown in a dimorphic form, with sympodial, plagiotropic fruiting branches. The growth of the orthotropic shoot is indeterminate, and lateral fruiting branches are produced by the leaf axils. Moreover, the orthotropic shoot's (clinging roots) at each node helps the

plant to climb over the supporting trees [13]. Leaves are alternate, entire ranging in length from 5-10 cm (2.0 to 3.9 inch) and in width from 3 to 6 cm (1.2 to 2.4 inch). The pepper flower is a complex bloom with a pale greenish-yellow colour [14], the tiny flowers are produced on pendulous spikes that are 4 to 8 cm (1.6 to 3.1 inch) long at the leaf nodes. As the fruit ripens, the spikes are grown up to 7 cm to 15 cm (2.8 to 5.9 inch) long [15]. Fruits are round or slightly oval in shape [14]. The dried, immature fruits of *Piper nigrum* are referred to as peppercorn, whereas the tiny, 3 to 4mm in diameter fruits of black pepper are called drupes. When the fruits are fully developed, they have a diameter of around 5mm and a dark crimson colour. A fruit contains a single seed [10], with a smooth surface and a diameter of 3-4 mm, seeds have a white or brown seed coat that contains oil. There are two types of roots: roots that grow above the ground act as adhesive roots, roots that sprout from hoops in the soil to generate lateral knuckles that act as absorbent roots (for nutrition) [14].

Flowering Period: May-August [16].

Habitat: Extensively cultivated in hotter and moist parts of India [16].

Propagation: By seeds and vegetative method [16].

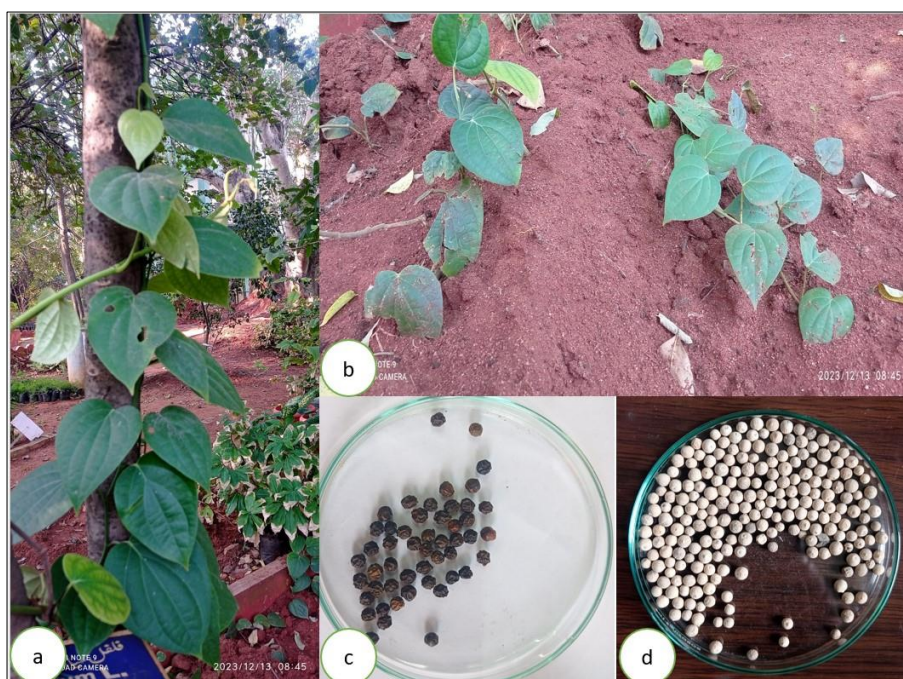


Fig 1: Showing *Piper nigrum* climber a., b. Filfil Siyāh c. & Filfil Safed d.

Taxonomical Classification [10]

Kingdom: Plantae.
Class: Magnoliopsida.
Sub class: Magnoliida.
Order: Piperales.
Family: Piperaceae.
Genus: Piper.
Species: Nigrum.

Description in Unani literature

In Persian language it is called as Filfil Siyāh, it is a popular wild and mountain fruit, with black colour and pungent taste [17]. Black pepper is of two types i.e. Black pepper and White pepper [18] (Fig. 1 c. & d.). Fruits are borne in clusters and every cluster contains 10-20 grains which are called black

pepper. The fruits are green and shriveled in the early stage and then turn black when dried [19].

Mutarādifāt (Vernacular names)

Language Common Names

Arabic: *Filfil Aswad* [17].
Ayurvedic: Maricha, Vellaja, Uushna, Suvrrita, Krishna [6].
Bengali: Golmorich, Kalamorich, Kolukung, Vellajung, Murichung [3].
Chinese: Fou Tsiao, Hou Tsiao, Hu Chiao [3].
Danish: Peper [3].
English: Black pepper [20].
Gujarati: Kalamari, Kalomirich, Miri [3].
Hindi: Kali Mirch [17].
Italian: Pepe, Pepe nero [3].

Kashmiri: Martz [3].
 Malayalam: Kolakam, Kurumulaka, Maricham, Mulaku [3].
 Persian: *Filfil siyah* [17].
 Punjabi: Gol Mirich [3].
 Philippines: Pimienta [3].
 Russian: Peretz [3].
 Sanskrit: Maricham, Maricha, Hapusha, Krishnam, Ooshnam, Valliyam [5].
 Spanish: Pimentera del Brasil, Pimienta Negra [3].
 Telugu: Marichamu, Miremu, Miriyamu, Miriyalu, Savyamu [3].
 Urdu: Kali Mirch [17].
 Unani: Filfil Siyah [6].
 Tamil: Milagu, Milaguver [6].

the papaya seed, which has a crenellated or wavy inner cell layer [21].

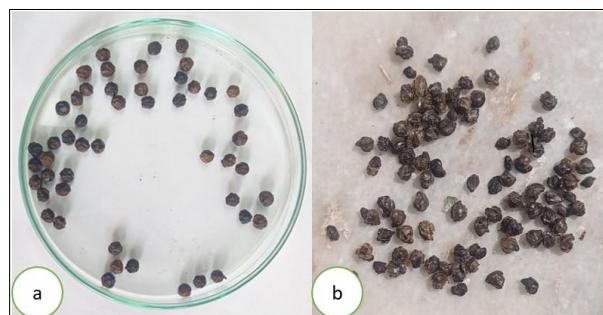


Fig 2: Showing Black pepper a. and Papaya seeds (adulterant) b.

Ajza-i-Musta'mala (Parts used): *Filfil Siyah* (Fruits) [19, 16].

Mizāj (Temperament): Hot [3] and Dry [3, 19].

Miqdār Khūrāk (Dose): The therapeutic dose is mentioned as: *Filfil Siyah* (Fruits) 4 g-9 g [19].

Af'āl (Action): It has *Muqawwi-i-Mi'da* (stomachic), *Muqawwi-i-Jigar* (liver tonic), *Mudammil-i-A'sāb* (nerve tonic), *Muhallil-i-Waram* (anti-inflammatory), *Tahlil-i-Riya* (carminative), *Mukhrij-i-Balgham* (expectorant) [17], *Mudirr-i-Bawl* (diuretic), *Mudirr-i-Hayḍ* (emmenagogue), *Dafi-i-Humma* (antipyretic), *Hāḍim* (digestive), *Mushtahī* (appetizer), *Dafi'-i-Samūm* (antidote), *Dafi'-i-Kirm-o-Shikam* (anthelmintic), *Nafakh-i-Shikam* (flatulence), *Muqawwi-i-Hāfiza* (increases memory) Muhammad (rube-facient), *Muharrrik* (stimulant to the skin) activities *Jālī* (detergent), *Musakkin* (sedative), *Muqawwi-i-Bah* (aphrodisiac), *Saylān-i-Dahn* (sialagogue) actions [20, 19].

Iste'mālūt (therapeutic uses): It is used for the treatment of respiratory diseases like *Dhīq-al-Nafas* (asthma), *Nazla wa Zukām* (cold), *Surfa* (cough) [22, 19], *Khunāq* (diphtheria), *Jālā* (cataract), *Baras* (leukoderma), *Dard-i-Dandān* (toothache), *Du'f-i-Ishthā* (dyspepsia), *Qabḍ* (constipation) in decreased quantity, *Mushil* (diarrhoea) in large quantity, *Suzāk* (gonorrhoea), *Qurūh-i-Maq'ad* (fissure), *Hāfiza* (cholera), Snake bites, Scorpion bites, *Shaḳīqa* (migraine), *Ratawandhi* (night blindness), *Bawāsīr* (Haemorrhoids), Pigmentation, fever, Boils, Alopecia, Sore throat, Jaundice etc. [19, 6].

Maḍarrat (Toxicity, side effect and adverse effect): It is toxic for the persons having Hot temperament and excessive use can be toxic for kidneys [18, 17].

Musleh (Correctives): Cold oils, Sirka, cold water for hot temperament Honey for kidneys [19].

Badal (Substitutes): In absence or non-availability of *Filfil Siyah*, *Zanjabil* (*Zingiber officinale Roscoe*) and *Filfil Safed* (*white pepper*) [19, 18] can be used as substitute.

Adulteration and its identification: Papaya seeds are used as an adulterant for black pepper (Fig. 2), due to their high availability, low cost and morphological similarities (in both whole and powder form). But although papaya seeds and black pepper appear nearly identical to the naked eye, microscopic techniques have proved useful for discriminating between these two commodities. The typical microscopic features of black pepper is a continuous inner cell layer that can be seen when the pepper corn is dissected. This is unlike

Compound formulations

Ḥabb-i-Kuchla, *Itrījal Kabīr*, *Jawārish-i-Hindi*, *Jawārish-i-Fotnajī*, *Jawārish-i-Kamūnī*, *Ḥabb-i-Bīsh*, *Ḥabb-i-Muqil*, *Ḥabb-i-Laqwa*, *Ḥabb-i-Surkh*, *Ḥabb-i-Khardal*, *Ḥabb-i-Filfil*, *Ḥabb-i-Surfa*, *Ḥabb-i-Hiltūt*, *Ḥabb-i-Tinkār*, *Ḥabb-i-Sana*, *Ḥabb-i-Hayḍ*, *Ḥabb-i-Nārmushk*, *Ḥabb-i-Munshīt* [23], *Ma'jūn-i-Fotnajī*, *Ma'jūn-i-Jalāli*, *Ma'jūn-i-Juntiyana*, *Ma'jūn-i-Kalkalānaj*, *Ma'jūn-i-Lana*, *Ma'jūn-i-Talkh*, *Dimād-i-Khanāzīr*, *Roghan-i-Balādur*, *Roghan-i-Qust*, *Roghan-i-Seer*, *Ṭilā-i-Jund*, *Safūf-i-Namak-i-Shekh-ur-Ra'īs*, *Safūf-i-Chutkī*, *Safūf-i-Hādim*, *Safūf-i-Na'na*, *Safūf-i-Tihāl Nawshādrī*, *Sunūn-i-Tambākū*, *Kohl-i-Yāsmīn*, *Barshāsha*, *Jawārish-i-Falāfīlī*, *Jawārish-i-Jālīnūs*, *Jawārish-i-Kamūnī*, *Jawārish Zar'ūni-Sada*, *Ma'jūn-i-Aqrab*, *Ma'jūn-i-Falāsfa*, *Ma'jūn-i-Juntiyana* [24].

Tarkīb Iste'māl (mode of administration)

Diseases of brain, skin, gastrointestinal system and respiratory system

- A preparation popular among Unani physicians are called *Jawārish Tursh* used in indigestion and hyperacidity in the stomach consists of pepper, ginger, *Embelia ribes*, black salt, rock salt, sodium chloride 1 palm each, *Mentha sativa* 2 palms, powdered and mixed with the juice of 10 lemons (3 gm to 6 gm twice a day) [5].
- Black pepper is useful in dyspepsia and flatulence, in doses of 10 to 15 grains in the powdered form [5].
- In case of alopecia, boils and other skin diseases, it is applied externally in the form of paste [5].
- Finely powdered Black pepper and Sesame oil is mixed well and then heated over a mild flame to form an efficient application and then applied over the affected parts in case of paralysis [5].
- In case of hoarseness, sore throat and toothache, an infusion of black pepper (1 in 80) forms a useful stimulant gargle [5].
- An infusion of roasted Black pepper berries are useful to stop the vomiting in case of cholera [25].
- Decoction of Black pepper acts as antidote in case of snake bite and scorpion-sting [19].
- When introduced into the nostril, a mixture of ghee and black pepper powder helps to relieve migraine [19].
- *La'ūq* (lincture) of honey, powdered black pepper and sugar is useful in asthma and cough [19].
- To treat Anxiety and Sahar (insomnia), powder of Asrawl (50 gm) along with *Filfil Siyah* (25 gm) is prepared and sieved in 60 no. mesh and 1 gram of this powder is given orally, twice a day [26, 27].

Chemical Constituents: Black pepper contains moisture, proteins, fats, fiber, carbohydrates, mineral matter, calcium, phosphorus, phytin phosphorus, iron, Vit A, oxalic acid [28]. The alkaloids are piperine, piperetin, chavicine, and an essential oil consisting of terpene, phellandrene, caryophyllene, piperonal dihydrocarbeol and caryophyllene oxide. The major components of the oil are sabinene, myrcene, limonene, alpha and beta-pinenes, caryophyllene, alpha-bergamotene, alpha-humulene, p-cymene and alpha-selinene [16]. Piperine is considered the major constituent and is responsible for the bitter taste of Black pepper [28].

Pharmacological studies

Anti-bacterial activity

The antibacterial activity of the Black pepper (*Piper nigrum* L.) was reported by [29] with particular reference to its mode of action on bacteria. They discovered that there was excellent inhibition of the growth of Gram-positive bacteria such as *staphylococcus aureus*, *bacillus cereus* and *streptococcus faecalis*. *Pseudomonas aeruginosa* was the most sensitive gram-negative bacteria, followed by *salmonella typhi* and *Escherichia coli*. The antibacterial action of the extracts appears to cause gram-positive bacteria to lose control over the permeability of their cell membranes, making them more vulnerable to their effects [30]. *Pimpinella anisum* L. (aniseed), *Laurus nobilis* L. (bay leaf), *Coriander sativum* L. (coriander) and *Piper nigrum* L. (black pepper) were all evaluated by [31] for their antibacterial potential against various bacterial isolates from the oral cavities of two hundred individual volunteers. The antibacterial activity of Black pepper (aqueous decoction) was shown to be highest at a concentration of 10 µl/disc, which was comparable to the aqueous decoction of *Laurus nobilis* and *Pimpinella anisum*. The antibacterial activity of silver nanoparticles synthesized with the help of *Piper nigrum* leaves and stems was assessed in a recent study by [32] against agricultural plant pathogens. The results demonstrated the excellent antibacterial activity of those nanoparticles present in *Piper nigrum* and exhibit antibacterial properties against *staphylococcus aureus*, *salmonella typhi*, *Escherichia coli* and *proteus sp* [33]. conducted photochemical analysis and investigated the antibacterial activity of the plant against human pathogenic bacteria.

Digestive activity of *Filfil Siyāh* (black pepper)

Numerous spices are well known for their ability to stimulate the digestive system [34]. According to [35], black pepper significantly shortens the time it takes for food to pass through the gastrointestinal tract and improves digestion by stimulating pancreatic enzymes. Piperine enhances the synthesis of saliva and gastric secretion, as well as the production and activation of salivary amylase [36]. Oral administration of piperine or *Piper nigrum* stimulates the liver to release bile acids, which are essential for the absorption and digestion of lipids [37].

Antidepressant activity of Black pepper

In a corticosterone-induced mouse model of depression, it was reported that the antidepressant efficacy of piperine and examined its potential mechanisms. After receiving corticosterone injections 3 weeks, mice exhibited behaviour resembling depression [36]. The depression was demonstrated by a significant decrease in sucrose utilization and an increase in immobility time during the tail suspension and forced swim tests [37]. Furthermore, corticosterone treated animals also

showed a significant drop in the amounts of mRNA and brain derived neurotrophic factor protein in the hippocampus. According to [38] corticosterone causes minimum behavioural and biochemical alterations in mice treated with piperine. These findings demonstrated that piperine had an antidepressant effect in a mouse model of depression caused by corticosterone [39].

Hepatoprotective activity of black pepper

In a mice hepatotoxicity model induced by D-galactosamine, it was discovered that piperine reduced the elevated levels of serum GPT and GOT in a dose-dependent manner. Wistar rats were used to test the hepatoprotective effects of a methanolic extract of *Piper nigrum* fruits after the rat liver were damaged by Ethanol-CCl₄, i.e. hepatotoxicity in the rats was induced by ethanol-CCl₄. Pre-treatment with piperine at a dose of 50mg/kg body weight, p.o. for 15 days and prophylactic treatment with methanolic extract of *Piper nigrum* at doses of 100 and 200 mg/kg body weight, p.o. with ethanol-CCl₄ treatment rats showed significant liver protection as demonstrated by the measurements of triglycerides, alanine transaminase, aspartate transaminase, alkaline phosphatase, bilirubin, superoxide dismutase, catalase, glutathione-reductase and lipid peroxidation, which are used to evaluate liver functions. In this study, triglycerides, aspartate transaminase, alanine transaminase, alkaline phosphatase, and bilirubin levels significantly increased upon administration of ethanol-CCl₄, whereas superoxide dismutase, catalase, and glutathione reductase levels significantly decreased and returned to normal following pre-treatment with methanolic extract of *Piper nigrum* and piperine. Following pre-treatment with a methanolic extract of *Piper nigrum* and piperine at specified doses, lipid peroxidations were also dramatically reduced. After 15 days at a dosage of 1ml/kg, p.o, the outcomes matched those of the reference standard, Liv52. The biochemical data were corroborated by the morphological and histological investigation of liver. Thus, it can be said that *Piper nigrum* has significant medicinal potential for the treatment of liver diseases and many have hepato-protective effect because of the presence of piperine alkaloids [40].

Conclusion

Reading about the *Piper nigrum* in classical Unani literature has revealed that it is a medication with several applications for treating a range of illness, including dysentery, cholera, dyspepsia, asthma and flatulence. Additionally, it has been mentioned that *Piper nigrum* played a significant role in the development of formulations intended to treat dermatological conditions. Hence, this review will help to conduct scientific studies in unexploited potential of this plant to get the maximum benefits.

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Conflicts of Interest: Nil.

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