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Review Article

The Role of *Ferula asafoetida* in Neurological, Antidiabetic and Gastrointestinal Therapies: Unani Perspective

Dr. Bushra Fasiha A.R. Shaikh*[1], Dr. Khadija Abdul Hafeez [2], Dr. Ghulammudin Sofi [3], Dr. Shariq-ur-rahim Shaikh [4], Dr. Momin Shahezad Aamir [5]

[1] Research scholar, National institute of Unani medicine Bengaluru, India

[2] Research officer, CCRUM, New Delhi, India

[3] Prof. Dept. of Ilmul Advia, National institute of Unani medicine Bengaluru, India

[4] Proprietor Hikmat Clinic Nagpur, India

[5] Associate Prof., Dept. of Tashreehul Badan, Mohammadia Tibbia college Malegaon, Maharashtra, India

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*Address for Correspondence:

Dr. Bushra Fasiha A.R. Shaikh, Research scholar, National institute of Unani medicine Bengaluru, India

Email: dr.bsheikh83@gmail.com

Abstract

Objective: To provide a comprehensive overview of Hilteet, including its traditional uses, botanical characteristics, chemical composition, pharmacological activities, and potential areas for future research.

Data sources: A review of literature on *Ferula asafoetida was* done based on bibliographic database viz. Science Direct, Scopus, Pub Med, and Google Scholar. Important informative data were also collected from classical and conventional textbooks, journals and resale.

Background: *Ferula asafoetida* Regal (Hilteet) is an oleo-gum-resin obtained from the rhizomes and roots of *Ferula asafoetida* Regel Syn., Ferula narthex Boiss, and other species of Ferula from the Umbelliferae family. It has a long history of medicinal use, first documented by Theophrastus and Dioscorides, and is frequently employed in Unani medicine. Traditionally widely used in Unani medicine for various ailments. Razi recommended its application in paralysis and developed "Majoon-e-Hilteet," which has been demonstrated as a nervine stimulant. Botanically it belongs to Umbelliferae family, Derived from specific species of the Ferula genus. Chemically it is composed of some bioactive compounds responsible for its medicinal properties. Pharmacologically it Exhibits nervine stimulant effects and other therapeutic activities, as supported by existing literature.

Conclusion and Future Directions: The review highlights the traditional significance and pharmacological potential of Hilteet while identifying opportunities for further research to advance herbal medicine.

Keywords: *Ferula Asafoetida*; ethnopharmacology; gastrointestinal; neurological; traditional medicine

1. Introduction

Ferula asafoetida, commonly known as Hilteet, is a perennial herb native to Persia and Afghanistan. The oleo-gum-resin extracted from its roots has been used for centuries in traditional medicine systems, particularly in Unani medicine. Abubakar Raazi formulated "Majoon-e-Hilteet" for treating paralysis, highlighting its nervine stimulant properties. The drug's use extends beyond Unani medicine, finding applications in various culinary traditions. *Ferula asafoetida*, commonly known as asafoetida or Hing, is a resinous extract derived from the roots of *Ferula* species, widely recognized in traditional medicine systems such as Unani and Ayurveda for its diverse therapeutic properties. This potent herb has been extensively used to address gastrointestinal disorders, including functional dyspepsia and bloating, with recent clinical studies highlighting its efficacy in improving digestive health and reducing symptoms like postprandial fullness and motion sickness[1,2]. Additionally, asafoetida exhibits neuroprotective effects, with research demonstrating its ability to mitigate neuronal damage and support oligodendrocyte survival in neurological disorders such as multiple sclerosis [3,4]. The herb's multifaceted applications in traditional medicine underscore its relevance not only as a remedy for physical ailments but also as an anti-diabetic, neuro-stimulant and sedative in emotional and nervous conditions [4,5]. Recent interest in natural product research suggests a potential resurgence in Hilteet studies.

2. Methodology

A review of literature on *Hilteet* was done based on bibliographic database viz. Science Direct, Scopus, Pub

Med, and Google Scholar. Important informative data were also collected from classical and conventional textbook textbook like *Muhit-i-Azam, Qarabadin-i-A'zam, Khazain-Al-Advia, Qarabadin Najm-Al-Ghani, Bustan-al-Mufradat, Makhzan-Al-Mufradat, Kitab-ul-Taklees, Almukhtarat Fi'l-tib, Mufta-ul-Khazain, Bayaz-e-Khas Al Maruf Ilaj-ul-Amraz,* National Formulary of Unani Medicine*, Al-Jamiul Mufradat al-Advia wa al-aghzia, Ilmul Advia Nafisi, Kitab Al-Fath Fi Al-Tadawi, Advia Ma'dania*, Indian Medicinal Palnt, Essentials of Medical Pharmacology, Textbook of Pharmacology, Nadkerni, Kirtikaar and Basu, kokate , Trees and Evans.

Botanical Description of *Ferula asafoetida*

Plant Morphology: The drug-yielding plant is a perennial herb. The resin is collected from plants older than 5 years by making incisions at the upper part of the taproot in March and April, just before flowering[6] .

Physical Characteristics of the Resin: Hilteet appears as rounded, flattened, or masses of agglutinated tears, greyish-white to dull yellow [7,8] or yellowish white to reddish brown[8] ; mostly, it is 12-25 mm in diameter[7] [7]; some others wrote 0.5 to 3 cm in diameters [8]; a freshly exposed surface looks yellowish and translucent of milky white, opaque, slowly becoming pink, then red, and finally reddish brown. Its odour is strong, characteristic, and persistent; taste is bitter and acrid. [6 7,9]

Vernacular Names: Hilteet has numerous vernacular names across different languages and regions, reflecting its widespread use:

Unani: Hilteet, Anguza [10]

Arabic: Anjudan, Hilteet [11], Tyib [12], Haltit, Hiltut [13,14]

Bengali: Hing, Hingra

Chinese: A Wei, O Oui

Persian: Angadana, Angoza [7], Anguzeh, Angzoo [7,11,15]

English: Asafoetida[7] [7,10] Devil's Dung, Food of gods[14]

French: Asafoetida, Ase Fetida, Ferule fetide, Ferule de Perse, laser cyrenaugue

German: Asafoetida, Steckenkraut, Stinkenderasand, Teufels Dreck

Greek: Skordola, saron[14]

Gujarati: Hing [7], Vagharni [7]

Hindi: Hingra [11], Hing [7,8]

Kannada: Hingu, Ingu, Hing [7]

Kashmiri: Yang [7], Anjudan[14]

Norway: Dyvelsadraek [14]

Malayalam: kayam, Perungayam, Perugkayam [7]

Marathi: Hing, Hira [7]

Oriya: Hingu, Hengu [7]

Punjabi: Hing[7]

Sanskrit: Agudagandha Balhika, Ramatta, Bhutnasan, Hingu, Sulanasan, Balhikha, Bhedna, Bhutari [7]

Sindh: Vaghayani[16] [14]

Tamil: Perungayam [14], Perungkayam[7]

Telegu: Ingura, Inguva, Ing [7]

Urdu: Hilteet, Hing [7]. Anjdana, Hing [14]

Afghani: Anguzakema, Khorakema, kurnekema [14]

Scientific Classification:[17]

Kingdom:	Plantae - Plants
Subkingdom:	Tracheobionta-Vascular plants
Superdivision:	Spermatophyta- Seed plants
Division:	Magnoliophyta- Flowering plants
Class:	Magnoliopsida - Dicotyledons
Subclass:	Rosidae
Order:	ApialesFamily: Apiaceae - Carrot family
Genus:	Ferula - ferula
Species:	*Ferula asafoetida* Linn [18]

Mahiyat (Identification):

This drug is an oleo-gum-resin obtained from the root of the *Anjdan* tree [19], mostly found in Punjab, Sindh, Multan, and Afghanistan. This resin is obtained by giving oblique incisions in the root of the tree; due to this, the secretion oozes over the surface, which has collected after drying, while the tree should be 4 years old or more. Unani physicians describe its two types: one has white flowers and fruit, and the height of the tree is approximately 2-4 feet, while another has black colour; hence, it is known as *Anjdan siyah* (black variety). This type isn't used in culinary purposes, but medicinally it is used, it has 4-5 feet height.

Ethnobotanical Description

Habitat: It is a perennial herb distributed from the Mediterranean region to central Asia, Iran Afghanistan (Karam & Chaghai dist.[8]. The genus Ferula is the third biggest genus of the Apiaceae family; it has 180 species, 15 of which are endemic to Iran, nine species to Turkey, seven to China, and one species to Italy, and the rest are indigenous substances of a few different nations. Three species of Ferula are found in India, Ferula narthex occurs in Kashmir[8], and grows wildly in Punjab Kashmir Persia and Afghanistan[20]. Mostly its native is Middle East [6 21]

Biological Sources: It is an oleo-gum resin obtained as an exudation by incision of decapitated rhizomes and root of *Ferula asafoetida* Regal [8].

Collection & Preparation for the Market: This 3-meter-height herb contains schizogeneous ducts and lysigenous cavities containing milky liquid. In Afghanistan, this resin is obtained from 4- to 5-year-old & 12 to 15 cm in diameter plant's carrot-shaped massive roots and rhizomes. In March and April, the upper part of the root is laid bare, and the stem is cut off close to the

crown just before flowering; the milky juice oozes out from the cut surface and starts coagulating; this cut surface is covered by a domed-shaped device made up of leaves and branches to avoid contamination with sand and foreign organic matter; after a few days, this coagulated resin is scrapped out and repeats the same process with fresh cuts for more resin. This is continued for 3 months or until the plant ceases the production of latex. On an average plant yield about 1 Kg of the oleo-gum-resin. Dried thoroughly and packed in suitable containers[226,10]. In market it is available in 3 different forms 1) tear-drop shape, 2) hard pieces, and 3) liquid, in which teardrop is considered a good one [6].

Types

Qairooniyas Hilteet which is acquired from qairooniya; it is odourless and changes body temperature even in small quantity.

Maidofoons Hilteet which is also called "**Mai**."

Saryanafs Hilteet imported from Syria having strong unpleasant smell and week in action.

Forniyaas Hilteet[15] .

According to smell, it is of pleasant smelling [23], sweet, bad smelling [19], and bitter[24 24,25].

Phytochemistry

Hilteet contains bioactive compounds such as sesquiterpene coumarins, sulfur-containing compounds, ferulic acid, and polysulfides. These constituents contribute to its antioxidant, antimicrobial, anti-inflammatory, and neuroprotective effects. Further studies are needed to fully elucidate the complex phytochemical profile of F. asafoetida and its impact on therapeutic outcomes.
Recent studies: Recent research has identified novel sulfur-containing compounds responsible for the characteristic odor and potential bioactivity.

Mizaj (Temperament):

Hot 4th degree dry 2nd degree [2326] Hot 3rd degree dry 2nd degree [23], Hot & Dry 4th degree [15]. Hot and Dry [6]. Hot 3rd dry 3rd [11 ,23].

Functions / Properties / Actions

Moharrik-e-Asab (nervine stimulant)

Hazim (digestive)

Kasir-e-riyah (carminative)

Daf-e-Taffun (disinfectorent)

Muddir-e-Baul (diuretics)

Mudirr-e-Haiz (emmenagogue) [7]

Dafe tashannuj (antispasmodic) [9,10]

Dafe Raasha (anti tremor)[11, 23]

Fluid extract of the resin, orally act as an emmenagogue [23], a stimulating expectorant, an anthelmintic, an aphrodisiac, and stimulant to the brain and nerves[11, 27]

Cholinergic, Histaminergic, antiulcerogenic.[24]

Stimulant [9], carminative [10], antispasmodic[6, 28], expectorant, laxative, nervine and pulmonary stimulant [10, 20]

Antioxidant,[29], antimicrobial [630,31]antiviral [32], antifungal [33], anthelminthic [10] abortifacient[23] diuretic [23] aphrodisiac [10,23]chemo-preventive[34], anti-diabetic[35], hypotensive [28]Anticancer [34], relaxant[36,37]neuroprotective. [23 24 25,38, 39]

Antispasmodic (Dafe tashannuj): Reduces muscle spasms and convulsions[9,10].

Anti-Tremor (Dafe Raasha): Alleviates tremors[11 23]

Pharmacological Activities Related to Neurological, Antidiabetic and Gastrointestinal Effects:

Hilteet demonstrates diverse pharmacological effects that make it effective for neurological, Antidiabetic and gastrointestinal therapies:

Neurological Effects:

The nervine stimulant properties are well-documented in Unani medicine, with recent studies suggesting potential mechanisms involving neurotransmitter modulation. Nervine Stimulant (Moharrik-e-Asab): Enhances nerve function and has been traditionally used for conditions like paralysis, epilepsy, Bell's palsy, chorea, numbness, tetanus, and hysteria [9,10,19, 23]. [40, 41, ,] Abubakar Razi formulated "**Majoon-e-hilteet**," which has been proven as a nervine stimulant in present scientific research. Fluid extract of the resin acts as a stimulant to the brain and nerves. [11, 23, 27,]

Neuroprotective:

Prevents neuronal damage, with recent studies suggesting potential mechanisms involving neurotransmitter modulation and antioxidant effects [24 38 39]

Nerve Stimulant:

The nervine stimulant properties are well-documented in Unani medicine[10 19 23] with recent studies suggesting potential mechanisms involving neurotransmitter modulation and antioxidant effects[24,25 38 39]. *Ferula asafoetida* is traditionally indicated in epilepsy, paralysis, hysteria[9 41] and related neurological conditions, reflecting its nervine tonic properties [10 19 23]

Antidiabetic Effects:

Ferula asafoetida, has garnered attention for its antidiabetic potential, supported by both modern pharmacological studies and traditional medicinal systems.[42] Belonging to the family Apiaceae, this oleo-gum-resin contains bioactive compounds such as coumarins, sesquiterpenes, diterpenes, and polyphenolic compounds, which play a significant role in its therapeutic properties.[43] Recent research has demonstrated that phytochemicals from *Ferula asafoetida* exhibit inhibitory effects on key enzymes involved in carbohydrate metabolism, namely α-amylase and α-glucosidase.[45] In silico studies have identified compounds like Kamolonol, Gummosin, Picealactone B, Farnesiferol A (α-amylase inhibitors), and Epi-

conferdione, Conferol, Feselol, Farnesiferol C (α-glucosidase inhibitors) as promising candidates for antidiabetic drug development, showing high binding affinity and favorable pharmacokinetic profiles based on Lipinski's rule of five and anti-carcinogenicity assessments.[43]

Traditional systems of medicine also highlight the antidiabetic potential of asafoetida In, Unani medicine classifies asafoetida as a stomach tonic (*Muqawwī-e-Meda*) and carminative (*Mukhrij-e-Riyah*), emphasizing its role in managing diabetes (Ziabetes)[46] by enhancing digestive power (Quwwat-e-Hazima) as noted in historical texts such as the National Formulary of Unani Medicine.[47] The convergence of modern pharmacological insights with traditional medicinal knowledge underscores the therapeutic potential of F. asafoetida in diabetes management.

Gastrointestinal Effects:

Hilteet has been traditionally used to relieve flatulence (Nafakh-e-Shikam), indigestion (Zofe-e-Hazm), and stomach weakness (Zofe-e-Meda), with emerging evidence supporting its role in modulating gut motility and reducing inflammation[7,48]. The traditional applications align with its digestive and carminative actions, enhancing gastric secretions and reducing flatulence, demonstrating a balanced approach to gastrointestinal health. Digestive Aid (Hazim): Improves digestion by stimulating gastric secretions[7,48] Carminative (Kasir-e-riyah): Relieves flatulence and abdominal pain [7,48].

Anti-ulcerogenic:

Protects against gastric ulcers, potentially by reducing inflammation. [24] Antimicrobial: Inhibits the growth of harmful gut bacteria [6 30 31]

Additional Uses (Documented in Unani Medicine):

Hilteet is used in traditional medicine for a wide array of gastrointestinal ailments: Nafakh-e-Shikam (flatulence), Zofe-e-Hazm (indigestion), and Zofe-e-Meda (weakness of the stomach). The document specifies its use as a carminative and nervine stimulant[48] Its Cholinergic, Histaminergic, and antiulcerogenic properties[24] support its application in managing gastrointestinal disorders

It also acts as an antidote to all animal poisons; even if a mad dog bites, it is also effective in injuries with poisoned arrows. Mixed with olive oil and applied on scorpion bite is very effective. It acts as an anti-inflammatory drug in "Abla or qarah" or other inflammatory conditions after wet cupping.

Hilteet has been traditionally used to relieve flatulence and indigestion, with emerging evidence supporting its role in modulating gut motility and reducing inflammation.

Pharmacological Uses:

It is very effective in neurological & psychological disorders like epilepsy, paralysis[6], Bell's palsy, chorea, numbness, tetanus, hysteria [9 41] etc[10 19, 23]. It has a very good effect in diseases of eyes, ears, nose, mouth, pharynx, gallbladder, stomach, and kidney. It has properties like disinfectant, nervine tonic, expectorant [12] and Demulcent [19].

It is beneficial to ascites that is caused due to phlegm. Its gum mixed with honey is applied to eyes as surma (eye applicator), which reduces the initial stage of cataract and enhances the eyesight. Locally, it is effective in dental carries as a painkiller; gargle with zoofa (Hysopus 0fficinalis), heeng (*Ferula asafoetida*), Injeeer (Ficus carica) and vinegar is also effective.

Therapeutic Dose:

0.3-1g [41] 400 mg[10] , 500mg [6, 11] 1.75g or 2.25g [23], 1g -3.5g [19,40].

Muzir (Adverse Effect):

In excess doses, it causes vomiting and is harmful for hot temperament individuals[12] (9), for the brain [23 26] or Liver, stomach [15, 23 19,40,] or ovaries[11], for Intestine and anus. [15]

Musleh (Correctives):

For the brain, liver, and stomach - Zarishk [10], Anarain[11] & Aneesoon. [10, 23]

For Intestine and anus - Kateera [11], Sandal safai[12] and Darhald [19,40],

for Brain- Banafsha, Nilofer & Aabe Seab[23]

Badal (Substitute):

Its Badal are Jaaosheer[12, 23, 19,40,] Tukhme hayat, Zeera [11,12 23] and Sakbeenaj [19, 23 40]

Murakkabaat (Compound Formulations):

Majoon-e-Antaki, Habbe-e-Hilteet[6]

Tila-e-Jund, Zimade-e-khanazeer [7]

Majoon Jograjguggul, Nmake sulemani, Majoon laqwa [6].

Identity, Purity, and Strength

Identification:

A freshly broken surface when touched with sulphuric acid produces a bright red reddish-brown colour, changing to violate when acid is washed off with water[7] .

Boil 0.2 gm. with 2ml hydrochloric acid for about one minute, dilute with an equal volume of water, and filter in to 3ml of dilute solution of Ammonia; fluorescence is produced [7].

Absence of Colophony Resin: Triturate 1g of asafoetida resin with 10 ml of light petroleum (b.p. 40-60) for 2minutes, filter into a test tube and add to the filtrate 10 ml of a fresh 0.5 per cent w/v aqueous solution of copper acetate: shake well allow the liquids to serrate; petroleum layer does not show any green colour, indicating absence of colophony resin.

Future Research Directions:

Investigating the specific molecular mechanisms by which Hilteet exerts its neuroprotective and gastrointestinal effects.

Conducting randomized, controlled clinical trials to validate the efficacy of Hilteet in treating neurological and gastrointestinal disorders.

Developing standardized Hilteet formulations to ensure consistent therapeutic outcomes.

Examining potential synergistic effects of Hilteet with conventional neurological and gastrointestinal medications.

Conclusion:

Ferula asafoetida remains a significant medicinal plant with documented uses in traditional medicine, particularly for neurological and gastrointestinal ailments. Integrating traditional knowledge with modern scientific approaches is crucial for unlocking its therapeutic potential and ensuring its safe and effective use. This review ensures the "Pharmacological Activities" more comprehensive, accurately reflecting the details provided in traditional document and adhering to modern and classical treatment requirements.

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