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Hiltit (*Ferula asafoetida* Regel.): Action and therapeutic uses in perspective of Unani medicine and pharmacological studies: A review

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Abstract

Hiltit or *Hing* is an oleo-gum-resin derived from the roots of *Ferula asafoetida*. It is an old traditional spice also used in medicine for the treatment of various ailments since long time including asthma, gastrointestinal disorders, intestinal parasites, and so on. This has been shown to have antifungal, anti-diabetic, anti-inflammatory, anti-mutagenic, and antiviral properties. This plant has a diverse range of chemical substances, including Carbohydrates, Proteins Minerals (Iron, phosphorus, calcium), fibers, vitamins and polysulfides. In this review, an attempt has been made to explore its USM and conventional medicinal activities.

Keywords: *Hing*, *Hiltit*, *Ferula asafoetida* Regel, Oleo-gum-resin, Unani Medicine

Introduction

Asafoetida is an oleo-gum-resin made from the exudates of the roots of *Ferula asafoetida*, an indigenous medicinal plant to Iran^[1]. The name '*Ferula*' is derived from a Latin word which means 'carrier' or vehicle where '*Asa*' is Latinized from Persian name which means 'resin' and Foetidus means 'smelling, fetid'^[2]. The disulphide present in the Asafoetida is said to be the primary cause of the oil's unpleasant scent^[3] *Ferula asafetida* is commonly known as asafetida or devil's dung. In India, it is commonly called as *Hing* or *Hingu*^[4]. *Hiltit* has been referred as the "Food of the Gods". It was described by a number of Arab and Islamic scholars and pharmacists. Ibn Sina (Avicenna) mentioned the effects of asafoetida on digestion. Ibn al-Baytar and al-Razi discussed some positive medicinal effects of it on the respiratory system. Asafoetida is in use from ancient times in Indian medicine and cookery as spice. In USM it is used to cure several neurological (epilepsy, paralysis, hysterias and depression), gastrointestinal (intestinal parasites, flatulence, weak digestion, stomach ache), respiratory (influenza, asthma) and reproductive (premature labour, unusually painful, difficult and excessive menstruation, leucorrhoea, and infertility)^[5].

Although other *Ferula* species, including *Ferula foetida*, *Ferula rubricaulis*, *Ferula rigidula*, *Ferula alliacea*, and *Ferula narthex*, are the sources of *Hing* (Asafoetida). *Ferula asafoetida* is regarded as the primary source^[1].

Asafoetida is available in two principal forms i.e. in mass form and tear form in which the mass form is the commonest type and easily available in the market. Asafoetida consists of mainly three portions including essential oil gum, and resin. A milky secretion exudes from the cut surface of rhizome and stems and the dried exudates are scraped off^[6].

Methodology

The available classical books of Unani medicine like *Al-Jami' Li-Mufradat al-Advia wal Aghziya*, *Muhit-i-Azam*, *Khazainul Advia*, *Makhzanul Mufradat* etc. were searched for the literature review. Additionally, various search engines like Research Gate, Google scholar PubMed and Science Direct were also searched using the keyword's *Hing*, *Hiltit*, Asafoetida, *Ferula asafoetida* Regel., Apiaceae etc. Review articles, Clinical trials, and experimental studies were taken into consideration for data generation. Two samples (Fig a. & b.) of *Hing*, one pure and other adulterated were procured from the authentic drug dealer.

Distribution

The species *Ferula foetida* has got its origin from Afghanistan and Iran. It has been distributed throughout the Mediterranean region to Central Asia. In India, it has been grown widely in Kashmir and in some parts of Punjab. It is also found in Persia and also in Central Asia between Caspian and Arabian Sea [7, 8].

Botanical description

F. asafoetida is a monoecious and perennial herb that belongs to the family Apiaceae. The height of this plant reaches up to 2 m with a bunch of leaves present in the circular form. The leaves of the plant are shiny, oblong, pinnate that grows up to 45 cm in length. The leaves are tri-pinnate with a length of 30-40 cm. Tap root is massive, thick and pulpy looks like carrot bearing diameter of 12-15 cm at the crown after 4-5 years. The outer bark of the root is blackish and wrinkled while it is fleshy, white, containing thick milky, fetid alliaceous juice from the inner surface. The stem is 2.5-3 m long, short, stout, hollow, 10 cm thick, succulent solid, smooth and herbaceous containing several ducts in the cortex that possesses resinous gum. Flowers are flat, thin and pale yellow in compound umbels. The fruits are oval, reddish-brown, thin, large, dark, slightly hairy, rough which is 0.8 cm long and 0.6 cm in breadth containing a milky juice. The white exudate of the fruit is pure, crystalline and fragrant [4, 6].

Scientific classification [9]

Kingdom: Plantae.
Division: Magnoliophyta.
Class: Magnoliopsida.
Family: Umbelliferae.
Genus: *Ferula*.
Species: *Asafoetida*.

Method of collection

After the four years the plant is uprooted and incisions are given on the roots [5]. The method employed for collection is to cut off a slice from the top of the root stock, from which at once a quantity of thick exudate oozes out. The root is then covered with a domed structure leaving an opening, thus protecting the exposed root from the rays of the sun. A thick gummy, reddish substance appears in more or less irregular lumps upon the exposed surface of the root which looks exactly like the ordinary asafoetida of commerce, used in medicine. This exudate is scraped off in spring with a piece of iron hoop or removed along with a slice of root and at once placed in a leather bag-the tanned skin of a kid or goat [8].

Māhiyat (description)

According to Unani physicians *Hing* is obtained from a tree known as *Anjadān*. It is not found in India but abundantly found in Punjab, Sindh, Multan, Persia and Afghanistan. It is of two types; (1) *Hiltūt Tayyib* also called *Hira Hing* which is extracted from white coloured *Anjadān* root (2) *Munish Hing* or *Hingu* which is extracted from black coloured *Anjadān* root [10].

Physical, organoleptic and microscopic characteristics of Asafoetida

Color: Yellowish-white changing to reddish-brown
Odour: The odour is intense, persistent, penetrating and alliaceous;

Taste: Bitter, alliaceous and acrid; **Size:** The tears are 0.5 to 3 cm in diameter; **Shape:** It occurs in 2 different forms i.e. tears and masses. Tears are rounded or flattened. [7, 11] The gum-resin, as found in the market, is yellowish brown, more or less translucent with small brittle masses or tears. [8] The drug is in form of gum resin therefore, the microscopical characters are not required to be worked out. [8] The absence of free umbelliferon in the medication distinguishes it from galbanum and is a distinctive feature [3].

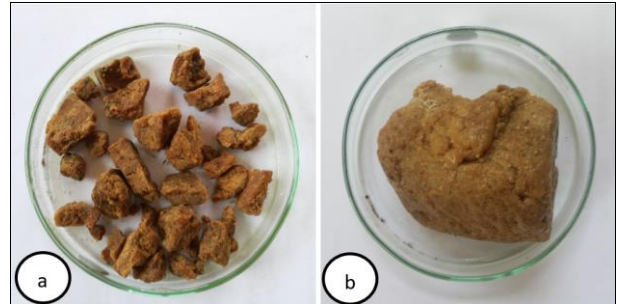


Fig 1: Showing pure Hing a. and adulterated Hing b. procured from the market

Mutarādifāt (Vernacular Names)

Arabic: *Hiltūt* [11, 12]
Bengali: *Hingra* [8]
English: *Asafoetida* [8]
Hindi: *Hing* [8, 11, 12]
Telugu: *Inguva* [8]
Tamil: *Kayam* [8]
Kannada: *Ingu* [8]
Malayalam: *Hingra* [8]
Spanish: *Asafoetida* [13]
Persian: *Anguza* [11]
Tamil: *Angua* [12]
Urdu: *Hing, Anjadān* [8, 12, 14]

Mizāj (Temperament)

Its temperament is considered as *Hār 4⁰* & *Yābis 3⁰* (hot in 4th degree and dry in 3rd degree), [15] and some says it *Hār 4⁰* & *Yābis 2⁰* (hot in 4th degree and dry 2nd degree) [8, 11, 16]

Af'āl (Actions)

Ferula asafoetida is used for its *Muqawwī-i-Dimāgh* (brain tonic), *Muqawwī-i-Basar* (toning up of vision) *Muqawwī-i-Jigar* (liver tonic) *Muqawwī-i-Mi'da* (stomachic), *Kāsir-i-Riyāh* (carminative), *Muḥallil* (resolvent), *Dāfi' Ta'affun* (antiseptic), *Mudirr-i-Bawl* (diuretic), *Mudirr-i-Hayḍ* (emmenagogue), *Muharrik-i-A'sāb* (nerve stimulant), *Dāfi' Tashannuj* (anti-spasmodic), *Muqawwī-i-Bah* (aphrodisiac), *Qātil-i-Kirm-i-Shikam* (anthelmintic) properties. [8, 11, 15, 16]

Isti'māl (Uses)

Hiltūt is used for the treatment of *Sar'* (epilepsy), *Fālij* (paralysis), *Ra'sha* (tremors), *Nafakh-i-Shikam* (flatulence), *Qūlanj* (gaseous large intestinal colic), *Dard-i-Shikam* (Gastralgia), *Ikhtinaq al-Rahim* (hysteria), *Du'f-i-Bāh* (sexual weakness) etc. [11, 15, 16].

Tarkīb-i-Iste'mālāt (method of administration)

Amrād-i-Chashm (diseases of eyes)

It strengthens the visions when applied along with honey. It also gives relief in cataract and pterygium [5].

Amrāq-i-Udhun (disease of the ears)

1. It is heated up with *Roghan-i-Zaytūn* (olive oil) and poured in to the ears which helps to reduced earache and tinnitus [5].
2. It is applied with *Zangār* (copper acetate) and *Phitkari* (alum) on the nasal polyp [5].

Amrāq-i-Dandān (disease of teeth)

The gargle with the decoction of *Hīng*, *Anjīr* and *Zūfa* helps to reduced pain of dental carries [5].

Amrāq-i-Ri'a (Disease of the Lungs)

It is beneficial in cough and chest pain when it is given with egg yolk [5].

Amrāq-i-bawl wa Tanāsul (Genito-urinary system)

When it is given along with *Piper nigrum*, it helps in amenorrhea and retention of urine [5].

Amrāq-i-Jild (Disease of the skin)

Paste of *Hiltit* prepared with *Anjīr* (fig) and vinegar is extremely beneficial when applied on tenia [5].

Ḥumma (fever)

Add 1g *Hīng* with 2 g salt and boil in 933.1 g water till become 84g. This is given orally to the patient of quarter fever (Malaria) [5].

Maḍarrat (harmful effects)

According to Unani physicians its excess use is harmful for brain, liver and contraindicated for the people having hot temperament [11]. A large dosage of asafetida can cause swelling of the mouth, digestive illnesses like diarrhea, flatulence, anxiety and headache [4].

Muslih (corrective): Several drugs like, *Katīra* (*Sterculia urens* Roxb.), *Banafsha* (*Viola odorata*), *Anār* (*Punica granatum*) are used as corrective of its adverse effects [11, 15].

Badal (substitute or alternative): *Zarishk* (*Berberis*

aristata DC.), *Anīsūn*, (*Pimpinella anisum* L.) can be used as alternative when the actual drug is not available [8].

Adulteration and its identification

Soapstone and other earthy materials and resins are adulterated in Asafoetida. Adulteration can be detected by various methods.

1. Asafoetida burns like camphor if pure, but not when adulterated with resin and gum.
2. Add a sample of water and let settle, if impure solution turn turbid due to presence of starch.
3. Little portion of sample is shaken with water and allowed to settle. If soapstone or earthy material present will be settle at the bottom.
4. The powdered sample of asafoetida is shaken using alcohol and filtered. To the filtrate added few drops of 10% FeCl₃ and the presence of foreign resin is indicated by an olive green colour.
5. The powdered sample of asafoetida is added Dil. Hcl until a faint turbidity appears. It is left aside for some time. Presence of galbanum is indicated by the appearance of bluish green colour.
6. To 2 ml of aqueous extract of asafoetida added few drops of freshly prepared solution of Sodium hypobromite. The presence of Ammoniacum resin is indicated by a Red colour.
7. To 2 ml of acetic anhydride extract of asafoetida added few drops of Conc. H₂ SO₄. The presence of Colophony resin is indicated by a purple red colour that turns into a violet colouration. To 2 ml of ether extract of asafoetida added few drops of Copper acetate. Appearance of green colour in ether layer indicates presence of Colophony resin.

Miqdār-i-Khūrāk (dosage): Its therapeutic dose mentioned in Unani literature is 250 mg-1g [16].

Compound formulations: The compound formulations in which *Hiltit* is one of the important ingredients are mentioned in Table 1.

Table 1: Showing name of compound formulations with their doses, method of administration, action and uses

S. N.	Compound formulation	Dose	Indication
1.	Ḥabb-i-Baras	250-500mg orally [17]	Leukoderma
2.	Ḥabb-i-Hiltīt	For oral use 500mg to 1g [14]	Flatulence, Anorexia, Indigestion
3.	Ma'jūn Antākī	For oral use 5 to 10g [14]	Headache, weakness of brain, gastric debility
4.	Ma'jūn Jogrāj Guggul	For oral use 5 to 10g [14]	Paralysis, Bell's palsy, Tremor, arthralgia, arthritis hemorrhoids
5.	Qurs-i-Mur	7 tablet (1g each) per day with Joshānda-i-Abhal [17]	Amenorrhea
6.	Qurs-i-Samūgh	Single dose of 3-5g with Joshānda-i-Hulba [17]	Difficult labor
7.	Qurs-i-Zahīr	2 tabs twice a day with water [18]	Gastric weakness, loose motion
8.	Roghan-i-Jund	For oral use 1-2 drops (in children) [17]	Epilepsy, Hysteria, Infantile convulsion
9.	Ṣadrī	3 g with lukewarm water twice a day [18]	Cough and asthma
10.	Tilā-i-Jund	For local application [14]	Nervine weakness, flaccidity of penis
11.	Tiryāq al-Asnān	1 to 2 g orally [17]	Toothache, glossitis
12.	Tiryāq Pechis Jadīd	3 g twice a day [18]	Diarrhoea
13.	Tiryāq-i-Afiyun	2-3g orally [17]	Opium Poisoning

Chemical constituents: Three main components of asafoetida are resin, gum and essential oil. Saponin and triterpenoids are also present. The oleo-gum resin contains free ferulic acid. By reacting with hydrochloric acid, ferulic acid transforms into umbellic acid, which then releases

water to make umbelliferon. One of the sesquiterpenes that are typically found in the resin component of the medication is galbanic acid [3]. The resin is partly soluble in ether or chloroform [8]. The detail is given in Table 2.

Table 2: Showing various compounds present in Asafoetida

Carbohydrates	Present
Saponin	Present
Coumarins	Sesquiterpenes like Asafoetidol A and B and colladonin, epiconferidone, 8-acetoxy-5-hydroxylumbelliprenin, karatavicinol, and asacoumarin have all been recently discovered [3].
Volatile oil	Disulfides, particularly 2-butyl propenyl disulfide (E and Z-Isomers) with monoterpenes (α - and β -pinene, etc.), valeric acid, free ferulic acid, and traces of vanillin [3].
Gum	Rhamnose, glucose, l-arabinose, galactose, glucuronic acid, polysaccharides and glycoproteins [3].
Resin	Resin made up of ferulic acid, umbelliferon, farnesiferols A, B, and C, asaresinotannins, and other ingredients. [3]
Vitamins	Carotene, riboflavin, and niacin [3].
Minerals	Iron, phosphorus, calcium [3].

Pharmacological Studies

Antidiabetic Activity

Asafoetida has a high concentration of calmodulin which transport calcium in beta cell. The sensitivity of the beta cell to Ca^{++} is increased by the action of another secondary messenger. Calcium stimulates the tyrosine kinase leading to activation of insulin and its secretion from the cell. This activity was observed by the boiling water extract of oleo-gum-resin (IP) dosage 0.2 g/kg for 14 days using Alloxan-induced diabetic rats [19].

Antispasmodic action

Fatehi *et al.*, (2004) demonstrated that *F. asafoetida* gum extract was helpful in reducing blood pressure in anaesthetized normotensive rats. This effect of gum extract on the contractile responses of the isolated guinea-pig ileum stimulated by histamine, acetylcholine, and KCl; therefore, mean arterial blood pressure in the rat was investigated. There was a decrease in average amplitude of contractions of the isolated guinea-pig ileum was observed when opposed to control. The exposure of precontracted ileum treated with acetylcholine to *F. asafoetida* gum extracts caused relaxation in a dose-dependent manner. The gum extracts appreciably reduced the mean arterial blood pressure in anaesthetized rats [20].

Antifungal Activity

It was reported that the essential oil extracted from the *F. asafetida* plant showed antifungal activity against different fungal strains. The ethanolic extract of the plant was found to be active on the agar plate. [21] The essential oil extracted from the rhizome at 400 ppm concentration showed an effect against *Microsporum gypseum* and *Trichophyton rubrum* and showed weak activity against *Trichophyton equinum*. [22] The asafetida extract at a concentration of 5-10 mg showed inhibitory activity against *Aspergillus parasiticus* aflatoxin production. [23]

Hepatoprotective Activity

The petroleum ether, chloroform, benzene, ethanol and aqueous extracts of a poly herbal formulation having *Ferula foetida*, *Momordica charantia* and *Nardostachys jatamansi* were evaluated for hepatoprotective activity against carbon tetrachloride-induced liver toxicity in Wistar rats. In this study the levels of serum enzymes such as glutamate oxaloacetate transaminase, glutamate pyruvate transaminase and alkaline phosphatase were determined. It was observed that administration of polyherbal suspension reduced the levels of serum enzymes. The biochemical observations were further supplemented by the histopathological examinations of liver sections. The experimental data suggested that polyherbal suspension of the extracts showed

promising activity against the carbon-tetrachloride induced hepatotoxicity [24].

Neuroprotective effect

Moghadam *et al.*, studied the neuroprotective and neurotoxic effects of aqueous extract of gum-resin of asafoetida. The results demonstrated that asafoetida gum-resin predominantly with 0.01 and 1 μ g/ml concentrations showed improvement in survival rate of neurons, whereas 10 μ g/ml was toxic. The neuroprotective effects could be credited to presence of flavonoids, phenolic acids, and polysulfide compounds present in Asafoetida [25].

Memory enhancing activity

The memorization and learning were evaluated using elevated plus maze and passive avoidance paradigm after administering two oral doses (200 and 400 mg/kg) of *F. asafoetida* aqueous extract with rivastigmine as a positive control. The extract produced a significant improvement in memory score and a dose-dependent improvement of transfer latency in elevated plus maze model. The significant improvement in antioxidant properties and dose-dependent inhibition of brain cholinesterase was also observed. Memory enhancing the potential of *F. asafoetida* can be allocated to acetylcholinesterase inhibiting and antioxidant properties. This study suggests that *F. asafoetida* can also be employed as an adjuvant to existing anti-dementia therapies [26].

Anti-obesity and fat lowering effect

Azizian *et al.*, determined the effect of *F. asafoetida* on weight gain, fat accumulation, liver steatosis and leptin level in type 2 diabetic rats. Two treatment groups received *F. asafoetida* oleo-gum resin at doses of 25 or 50 mg/kg. Administration of *F. asafoetida* extensively decreased body weight, abnormal fat and size of epididymal adipocyte compared to untreated rats. Serum leptin levels were considerably decreased in treated rats. The results revealed that *F. asafoetida* gum has potent anti-obesity activities, fat lowering and can prevent liver steatosis. *F. asafoetida* gum can be a good candidate for the treatment of diabetes-induced obesity and hepatosteatosis [27].

Conclusion

Hiltit or Hing, derived from the roots of *Ferula asafoetida*. It has been utilized for centuries in both culinary and medicinal contexts, offering treatment for various ailments such as asthma, gastrointestinal disorders, and intestinal parasites. Studies have revealed its diverse pharmacological properties, including antifungal, anti-diabetic, anti-inflammatory, anti-mutagenic, and antiviral effects. Furthermore, the plant contains a wide array of chemical

compounds such as carbohydrates, proteins, minerals (iron, phosphorus, and calcium), fibers, vitamins, and polysulfides. The review aims to explore both the traditional uses and conventional medicinal activities of *Hilfit*, shedding light on its potential health benefits and therapeutic applications. Further research and exploration in this area could lead to a better understanding of its mechanisms of action and potential integration into modern medicine.

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Conflict of interest

Authors have declared that no competing interests exist.

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