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A Systemic Review on *Ferula asafoetida*

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GRAPHICAL ABSTRACT

Keywords: *Ferula asafoetida, Spice, Pharmacology, Gum Resin, Phytochemistry.*

INTRODUCTION

As we know that India is called the botanical garden of the due to its large contribution of the herb producing capacity in the world [1]. As we are well familiar with the various herbal plants which serves as a medicines including *Cissus quadrangularis* [2], paclitaxel against cancer [3], and *etc* [4]. As per the past traditional systems of medicine, herbal as well as medical plants has gained an significance due to its high safety and the potential to show the therapeutic effects [5,6]. India and the developing neighbouring counties are leading towards the use of the medicinal plants [7]. According the numbers provided by the WHO about 75% relies on the plant extracted medicines for the treatment of the disease or the ailment [5]. The ratio of people is diverting rapidly towards the use of the therapeutic plants as opposed to compound medications [8,9,10]. Herbal plants showing less toxicity, also the cost and side effects [8,11] the preference for use of the medicinal plants rather than chemical drugs is more thought out [9,12]. The various reasons for gaining high significance is due to the presence of the various phytochemicals gained from the universal diversity thus leading an extra demand for the use of the herbal

formulations [6] India on an average nearly produces about the 40% of the world's total production of asafoetida [13]. Asafoetida or the Hingu, the oleo gum resin of Ferula asafoetida is among those herbs which are not only used by the physicians but also the part of the home remedy and the kitchen. The Latin name ferula signifies "transporter" or "vehicle". Asa is a Latinized type of Farsi asa "gum ", and Latin foetidus signifies "smelling, foul" [7,9,10,14]. Basically there are two main varieties of Asafoetida *i.e.* Hing Kabuli Sufaid [Milky white asafoetida] and Hing Lal [Red asafoetida] [15]. It also occurs in the two main principal forms, mass and tears and mass form is the most common in the market [11].

The cost for One kg of pure asafoetida goes upto an average of Rs 35,000 to Rs 40,000 in the international market. Hence, one hectare plantation is likely to increase farmer’s income by seven times. Also the production of asafoetida in the country would help to reduce the dependence on other countries; this will save the foreign exchange. Overall in this review, an attempt has been made to collect the detailed information on the Asafoetida including its botanical description, origin and distribution, uses, chemical composition, Pharmacology, Toxicology and the various marketed formulations have also been under the limelight [13].

OTHER NAMES

Anghuzeh [Farsi] [9,11]
Asafétida [Spanish] [9,11,16]
Asafoetida; awei [Chinese] [9,11,13,16]
Aza [Greek] [9,11,16]
Devil’s dung; férule Presque or merde dudiable [French] [9,11]
Haltit or tyib [Arabic] [9,11]
Hengu/Hing/Ingu/Inguva/Kayam/ Perungayam, Perunkaya, Raamathan [Hindi] [9,11,13,16]
Mvuje [Swahili] [9,11]
Stinkasant/Asafotida/Asant/ teufelsdreck [German] [9,11,13,16]
Kama I anguza [Afghanistan] [7,26]
Hing [Bangladesh] [13,16]
Asafetida [England] [13,16]
Zaz**,**Anghouzeh ,Khorakoma and Anguzakoma, Rechina fena [Iran] [12,13,16]
Sagapeen,Asafetida, Duivelsdrek, Godenvoedsel[Netherland] [13,16]
Anjadana/Kama I anguza [Pakistan] [13,16]
Asafetida [Russia] [13,16]
Perunkayan [Srilanka] [13,16]
Denmark Dyvelsdrak [16]
Asafetida, Hajupihka, Pirunpaska, Pirunpihka [Finland] [16]
Asafetide, Assa foetida, Ferule persique, Merde du diable[France] [16]
Ordoggyoker [Hungary] [16]
Assafetida [Italy] [16]
Sheingho [Myanmar] [16]
Dyvelsdrekk [Norway] [16]
Asafetida, Zapaliczka cuchnaca [Poland] [16]
Asafetida, Dyvelstrack [Sweden] [16]
Mvuje [Tanzania] [16]
Shing-kun [Tibet] [16]
Setan bokosu, Seytan tersi [Turkey] [16]
Asafetida, Devil's dung, Stinking gum [United States] [16]

SYNONYMS

Sanskrit : Ramatha, Sahasravedhi [6,17]
Assam : Hin [6]
Bengali : Hing [6]
English : Asafoetida [6,17,18]
Gujarati : Hing, Vagharni [6]
Hindi : Hing, Hingda [6,17]
Kannada : Hingu, Ingu [6]
Kashmiri : Eng [6]
Malyalam: Kayam [6]
Marathi : Hing, Hira [6]
Oriya : Hengu, Hingu [6]
Punjabi: Hing [6]
Tamil: Perungaayam [6,18]
Telugu : Inguva [6]
Urdu : Hitleet, Hing [6]

TAXAMOMICAL CLASSIFICATION

Kingdom – Plantae [6,11,14,17]
Subkingdom – Viridiplantae [17]]
Infra kingdom - Streptophyte [17]
Superdivision – Embryophytes [17]
Division –Magnoliophyta [6,11]
Tracheophyta [18]
Subdivision – Spermatophyta [17]
Class – Magnoliopsida, [6,11,17]
Angiosperms [unranked]: Eudicots [unranked] [24]
Superorder – Asteraceae [17]
Order – Apiales [14]
Family: Umbelliferae [8,10,15,19,20]
Apiaceae [12,13,14,17,21,22]
Genus – Ferula [6,11,14,17]
Species - *Ferula asafoetida* [6,11,14,17]

BACKGROUND AND HISTORY

In the Past of the middle Ages, a gum was worn around the neck to treat the diseases like colds and fevers. But interestingly no one had idea about its effect. But it showed the desired effect. Later on it was known that the effect was due to the antisocial properties of the gum and not any medicinal virtue. In the later period the use of asafoetida was also used as condiment and there after called as the "food of the gods". Hingashtak one of the oldest and effective herbal formulations contains Asafoetida as the main. The Sanskrit name for Hingashtak is hing. In Persia it was used as a main ingredient in their almost all the dishes. French gastronomes use this by rubbing it with quantity on hot plates to eat the beef steaks. The distinctive .The Pleasant taste or the flavour of the popular sauce *i.e*, Worcestershire sauce is due to the addition of this gum. Upon addition with the discretion, it adds an additional taste to the curries, stews, gravies, etc. It has also been used as flavour in the formulation of the perfumes. Till date it is been used as a medicinal in Europe. As per the various magical and mythological sciences it has been used to gain insight and to banish all negative energy, evil spirits and demons. Evoking of the male gods with the phallic nature is also done.An past myth claims that asafoetida is been developed from the semen of a god of fertility when it was soaked into the earth [9]

AYURVEDIC PROPERTIES

Rasa : Katu
Guna : Tikshna
Vipak : Katu
Virya : Ushna
Dosha : Balances
Vata, Kapha and increases Pitta [6]

TASTE AND SMELL

Smell: Fetid like smell [9,11]
Taste: nauseating [2,4] Bitter, alliaceous and acrid [6,15]
Colour: Yellowish-white which then changes to reddish-brown
Odour: Intense, persistent, penetrating, alliaceous [6] and pungent [15]
Size : The tears range in size to about 0.5 to 3 cm in diameter
Shape: It occurs in 2 different forms i.e. tears and masses. Tears are rounded or sometimes flattened [6]

ORIGIN AND DISTRIBUTION

The genus Ferula consists of about 130 species worldwide with the majority of thirty species found in Iran, of which fifteen are endemics From India, only four species have been reported. [13]Asafoetida has been distributed throughout the Mediterranean region to Central Asia eastern Iran [7,23]. to Afghanistan, and today it is grown chiefly in Iran and Afghanistan with the well known species, F. asafoetida and while F. narthex Boiss [13] from where it is exported to the rest of the world. [6,9,16]. It In India it has been grown widely in Kashmir and in some parts of Punjab [6,15].It has been a native to Pakistan [25,7]. Ferula species are found in arid regions of temperate Eurasia, in the Canary Islands and in North Africa [e.g. Tunisia] [21]. It has also been found in the

Iraq, Turkey and Eastern Iran, Europe and North Africa [6]. F. asafoetida is one of the important species of Ferula and is more native to Afghanistan and Iran [16].

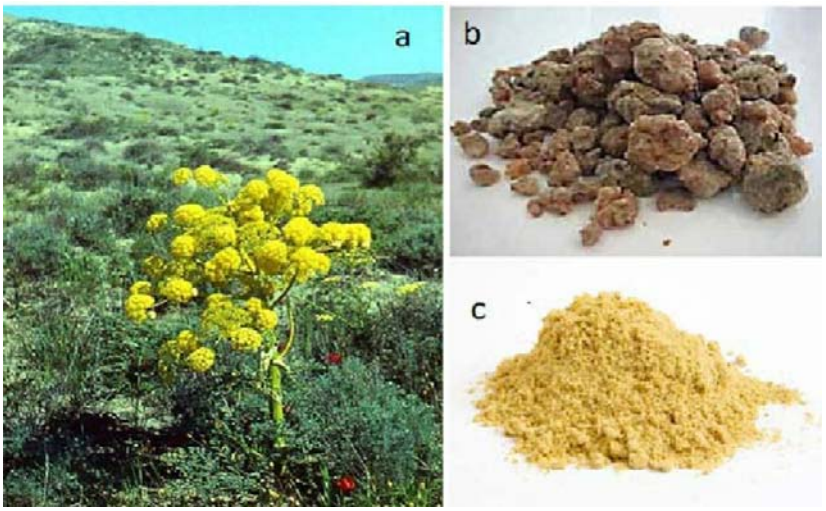


Fig 1. A. Asafoetida plant B.Asafoetida Rock C. Asafoetida Powder

BOTANICAL DESCRIPTION

The extraction of asafoetida is done from the Ferula plant. [9,16]. Ferula asafoetida is a herbaceous plant [8] It is a perennial plant and it attains a height of up to 12 feet [1-1.5 m] [11,14,15] in wild with a circular mass of 30-40 cm leaves. [6,13] It requires dry or moist soil for its growth [15]. Asafoetida has 2 types, male and female. Inflorescences are produced from detail plants.The male plant does not produce any inflorescences. Also the female plant produces the oleo gum or asafoetida [13]. The shrub of Asafoetida nearly needs about 4 to 5 years for producing the seed [11].

Flowers: Flowering stems are 2.5-3 m high and 10 m thick and hollow. These flowering stems have number of schizogenesis ducts in the cortex containing resinous gums. The flowers are small and dirty yellow coloured produced in large compound umbels [6,11,17].The flowering occurs in the month of March-April[9,13] . Flowers are pale greenish-yellow in colour borne in large compound umbels. It has about 10–20 flowers in main umbels and 5–6 in the partial umbels [6].

Fruits: Fruit is oval, thin, flat, reddish brown in colour and contains milky substance. [6,17]. The fruits are 0.8 cm long and 0.6 cm broad, with tender hairs. The white exudate of the fruit is fragrant, pure and crystalline. The brownish to reddish exudate smells foul [13].

Roots: Roots are thick, massive and pulpy [6,17]. Carrot shaped roots are thick, massive, and pulpy which are covered with bristly fibres, with one or more forks. After about five years, the fusiform taproots attain a diameter of 12 to 15 cm at the crown which gives the indication that plant is ready for extraction of asafoetida. Roots yield a resin similar to that of the stems [13]. Before the plants flower, the upper part of the living rhizome root is laid bare and the stem cut off close to the crown. A dome-shaped structure made of twigs and earth covers the exposed surface. A milky juice exudes from the cut surface. The exudates are scraped off and a fresh slice of the root cut when more latex exudes, sometimes the resin is removed along with the slice. The collection of resin and slicing of the root are repeated until exudation ceases. [16] taproots or carrot-shaped roots, 12.5-15 cm in diameter at the crown when they are 4-5 years old. A

dome-shaped structure made of twigs and earth covers the exposed surface [9].

Stems: stems are 10cm thick which are hollow inside with a number of schizogenesis ducts in the cortex containing the resinous gum. It has large, compound, bipinnate, pubescent radical leaves with sheathing petioles. The inflorescence is also densely pub [13]. The stem leaves have wide sheathing petioles. The foul odor comes from the resin like gum extracted from the stems and roots [6].

Bark: The bark is black and wrinkled which contains great amounts of gelatinous alliaceous juice [11].

CHEMICAL CONSTITUENTS

Ananalytical study of asafoetida shows that the concentration of the carbohydrates is aboout 67.8% per 100 gms, and also the moisture is 16.0%, protein conc was 4.0%, fat as 1.1%, minerals as 7.0% and fiber 4.1%. [9,11,13,16,24]. The mineral and vitamin contents include substantial calcium besides phosphorus, iron, carotene, riboflavin and niacin. Its calorific value is nearly about 297, contains 40-64% resinous material composed of ferulic acid, umbelliferon, asaresinotannols, farnesiferols A, B, and C.[6,9,13,24].The three main portions in Asafoetida includes gum [25%], resin [40-64%], and essential oil [10-17%] [6,11,15,16,24]. The resin portion contains coumarins, sesquiterpene coumarins, and ferulic acid and its esters and other terpenoids. About 25% gum composed of glucose, galactose, l-arabinose, rhamnose, and glucuronic acid [9,11,16,24] polysaccharides, and glycoproteins [11,26].

The garlic like odour of the oil is due to the presence of sulphur compounds.[15] The volatile oil [3-17%] consisting of disulfi des as its major components, notably 2-butyl propenyl disulfde [E- and Z-isomers] with monoterpenes [α- and β-pinene, etc.], free ferulic acid, valeric acid, and traces of vanillin [LAF]. The disagreeable odour of the oil is due to the disulphide C11H20S2. [9,6, 11,13, 15,15, 24]. Organic sulphur compound, Essential oil of garlic-allyl, allyl persulphide, Ferulic acid, Malic acid, Acetic acid, Formic acid, Valerenic acid were also reported [18]. Alomg with this numerous terpenoidal compounds present additionally which are α-pinene, phellandrene, bornyl acetate, α-terpineol, myristic acid, limonene, longifolene, cadinene, fenchone, eugenol, linalool, geraniol, β-caryophyllene, β-selinene, farnesol, cadinol, guaiacol, myrcene were also traced [6].

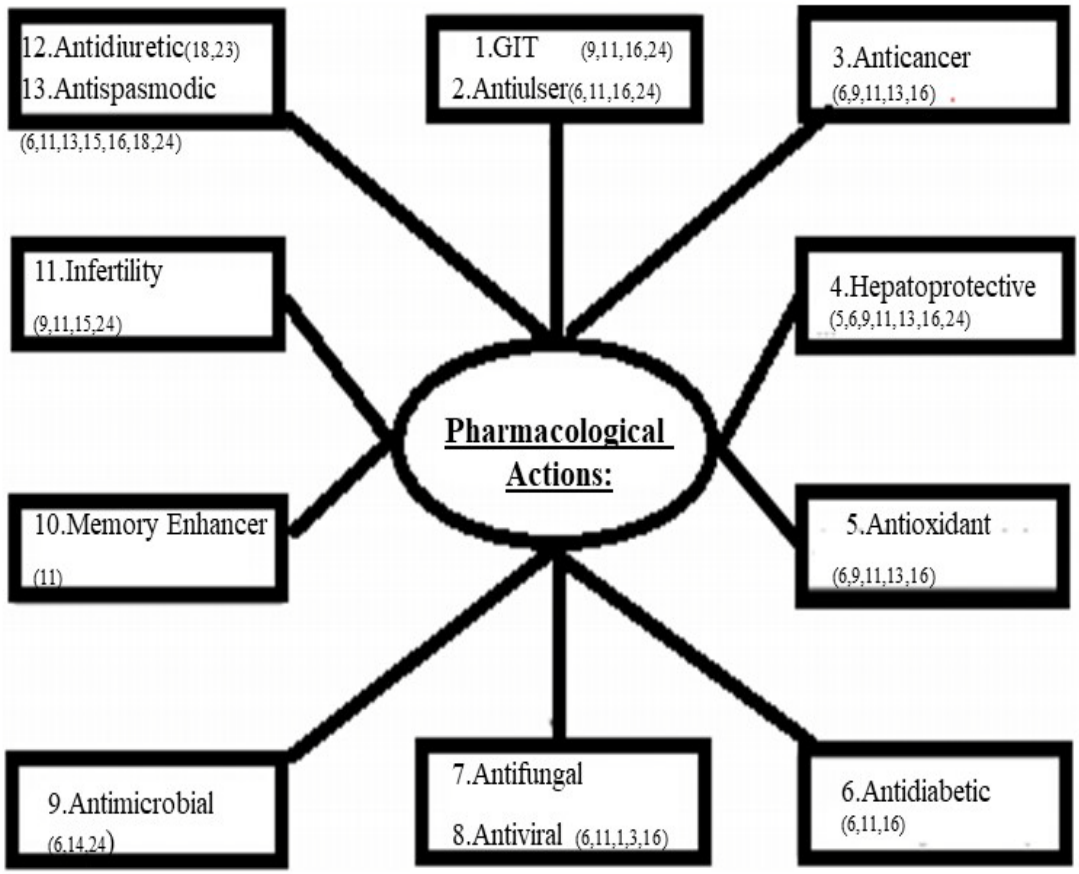
TOXICOLOGICAL STUDY

Most of the studies shows that Asafoetida has been found to be relatively non-toxic in nature.[6]But as we know that there are some or the other side effects or the toxic effects of each drug. Asafoetida sometimes may enhance the activity of warfarin. [9]. Methemoglobinemia was observed in a 5-week-old infant when given with milk [6] after treatment with a gum asafoetida formulation to alleviate colic. [2,4,26]. When large dose of Asafoetida is administered it leads to bulging of the mouth, along with few digestive complaints including the diarrhoea and flatulence, nervousness, and mild headache[5]. Intake of Asafoetida is not safe to prescribe during the pregnancy. [11,16]. Extensive facial and oral swelling is one of the allergic reaction of asafoetida [6].

A weak sister chromatid exchange-inducing effect in mouse spermatozoon and clastogenicity in mouse spermatocytes has been documented for asafoetida. Chromosomal damage by asafoetida has been associated with the coumarin constituents.[6,9]. It was noticed that asafoetida shows an oxidizing effect on the

fetal haemoglobin but not when seen in the adult haemoglobin. Skin rashes have been noticed in the few patients.. Swelling of the lips has been noticed after the use of asafoetida [6].

PHARMACOLOGY



Pharmacological Action of Asafoetida

MEDICINAL USES

I] World Wide Uses of Asafoetida

1) In Afghanistan hot water extract of the dried gum is met to be taken orally for hysteria and whooping cough and to treat ulcers.
2) Decoction of the plant is taken orally as a vermifuge in China.
3) Hot water extract of the dried root is taken orally as an antispasmodic, a diuretic, a vermifuge and an analgesic in Egypt.
4) Gum is chewed for the treatment of the amenorrhea in Malaysia and also as antiepileptic in Morocco.
5) In Nepal eat it, in daily diets and also thought that Asafoetida has diuretic, sedative, and aphrodisiac properties. [11],Water extract of the resin in Nepal is taken orally as an anthelmintic also people
6) In Saudi Arabia dried gum is used medicinally for whooping cough, asthma, and bronchitis.
7) In Brazil hot water extract of the dried leaf and stem is taken orally by males as an aphrodisiac and oleoresin powder, crushed with the fingertips, is used as a condiment.
8) Fluid extract of the resin is taken orally as an emmenagogue, a stimulating expectorant, an anthelmintic, an aphrodisiac, and a stimulant to the brain and nerves and

claimed to be a powerful antispasmodic in United State.

9) In Iranian folk medicine, asafoetida was also used as a medicine for the treatment of asthma [13].

II] OTHER USES

1) The flavor is utilized as a stomach related guide in food as a fixing and in pickles [8,23]
2) It was all at once utilized in the treatment of childish pneumonia and flpompous colic. [8]
3) It is also used as contraceptive/ abortifacient.[15]
4) In Ayurveda, asafoetida is considered to be one of the best spices for balancing the vata dosha. [15]
5) It also diminishes the blood and brings down pulse and is broadly utilized in India in food and as medication like Ayurveda. [8]
6) It is also used in the treatment of various diseases such as intestinal parasites, flatulence, influenza, epilepsy, stomachache, asthma, and weak digestion. [11].
   Asafoetida has long been used in traditional medicine for the treatment of several diseases like epilepsy, paralysis, hysterias, depression, intestinal parasites, flatulence, weak digestion, stomach ache,asthma, premature labour, unusually painful, difficult and excessive menstruation, leucorrhoea, infertility and influenza *etc*. [8,13,18]
7) It works as a great antidote against snake bite and as an insect repellant when mixed with garlic.
8) Mixing asafoetida with sufficient quantities of water has shown great promises against migraine and headaches [6]
9) In India, dried extract of F. asafoetida with Brassica alba and rock salt was diluted with vinegar and taken orally as an abortifacient [13]

MARKETED FORMULATIONS

1) Hingwashtakchurna
2) Agnimukhchurna
3) Hinguvachadichurna
4) Hingutrigunaleham
5) Ashtachurnam
6) Hingwadigulika
7) Ayaskriti
8) Phalasarpis
9) Pulileham
10) Kumaryasavam [25]

CONCLUSION

On the basic of the completed review study it can be concluded that Asafoetida Linn belonging to family Umbelliferae shows various activities. One of those being as an all round spice. It has become as a one of those main ingredients of the daily kitchen. It has various vital chemical constituents in it so it has various pharmacological activities. As we know every stuff then herbal or Non herbal has some or the other toxic effect so it has some toxic effect. Overall Asafoetida has great medicinal importance but detailed studies of asafoetida is required prior to clinical trial which indeed will give some more interesting results in future.

CONFLICT OF INTERESTS

The author's declare no conflict of interest with the publication of this article.

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