Asafoetida (Heeng): The Well Known Medicinal-Condiment of India & Iran

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Abstract

The paper deals with the Ferula species, which yield 'Asafoetida' or 'Heeng', an oleo-gumresin commonly used as a condiment and spice and also in traditional medicine, in number of countries. It deals with the distribution of the 'Asafoetida' yielding species, the method of extraction, the chemical constituents of the oleo-resin, its pharmacology and its uses in different parts of the world and in India & Iran. The different varieties of 'Heeng' used to be sold in Indian bazaar.

Introduction

Asafoetida (Heeng) is a well known medicine and condiment of India, Pakistan and Persia (Iran). India consumes about 70% of the world produce as a culinary and in medicine and supply (re-export) it. It is recorded that only a few species of Ferula yield Asafoetida.

In this paper efforts have been made to collect information about all the species, that yield Asafoetida, and used in medicine and as spice in culinary(cooking). Its chemical constituents and the pharmacology of the chemical compound and its present status has also been reviewed.

Different names and etymology of the condiment:

Asafoetida has a strong, characteristic odour and the name Asafoetida originates from the Persian word aza (mastic resin) and a Latin word foetida, meaning bad-stinking resin. It is also called 'devil's dung' because of its strong pungent smell, which is due to the presence of sulfur compounds.

The perennial Asafoetida plants are native to the region between the Mediterranean and Central Asia, especially, Iran, Turkey and Afghanistan and most of the world's production of Asafoetida comes from the above two countries. India is the major consumer as well as the supplier (re-exporter) of this condiment.

The species that yield Asafoetida: According to Santapau & Henri, (1973) there are about 130 species of Ferula found in the world, and only 4 have been reported from India. However, Nasir & Ali (1974) report 140 species of Ferula, and out of these 11 are found in Pakistan. Asafoetida is a hard aromatic resinous gum, which has a strong characteristic smell due to the presence of sulphur compounds, which is used as a spice and medicine, in number of countries but only a few Ferula species yield 'Asafoetida' or 'Heeng'.

The condiment 'Asafoetida' or 'Heeng' is basically comes to India from Iran (Persia) and Afghanistan since time immemorial. The species which yield 'Heeng' are; F. assa-foetida Linn, from Iran Turkey and Afghanistan and F. narthex Boiss from Afghanistan Baltistan, Astore, Kashmir(Pakistan), and W. Tibet and F. alliacea Boiss from Iran and Afghanistan.

According to Rau (1975,p.113) in the West Himalaya only one species, i.e., F. jaeschkeana Vatke. is reported from Kashmir, Lahul (3600m), it is a large shrub with cauline sheath and large compound leaves. The umbels are large and bear large yellow flowers and large ovoid fruits.

However, when I visited Ladakh in 1975, I was especially told by Dr.L.D.Kapur our Officer-in-charge to collect the plant and its oleo-resin. Unfortunately, we could not see and collect the plant, only some folk information was collected. It is locally known as 'Kalindoor' (Kashmiri), Hortung prongos (Balti) and 'Thuka' (Ladakhi). Its latex is applied on cuts & wounds. It was further stated that Ferula narthex Boiss is recorded by the Balti people at Gund village near Sonmarg and they prepare Asafoetida from the latex of the root/rhizome but no sample could be collected, Raghunathan, & Ramadas, (Eds) (1978, p.46.).

Botanical sources of Asafoetida (Heeng): As we know 'Asafoetida' is an oleo-resin from the Ferula. Species. Dutt (1928) had reported the following species: Fallicaeae Boiss, F. foetida Regel (F. assa-foetida Linn) and Fegalbaniflua Boiss & Buhse. And, Asolkar et al (1992) had reported, Fallicaeae, F.assa-foetida, F.galbaniﬂua Fjaeschkeana and Enarthex. However, Farooqi (2008, p.125) has listed the following species, Ferula foetida Regel. (F. Assa-foetida Linn); Ferula alliacea Boiss; Fruricaulis Boiss and F. narthex Boiss.

Not only oleo-resin of the species of Ferula are used but in Turkey Ferula orientalis and F.communis known in Turkish, “Erkek”, “Caskir” and “Cavser” the herb is used as condiment and exported. However, the following Ferula species do not yield 'Heeng' but other products, which are used to mix with it are: F. galbaniflua Boiss & Buhse yields Galbanum; F. persica Willd (known as Sagapenum, Sagbinaj); F. sumbul Hook, f (sumbul musk root); F. szowitiziana DC (sagapenum, sagbinaj).

Coppen (1995,p.108) has very clearly described the Ferula species which yield 'Asafoetida' or 'Heeng' and are; Ferula assa-foetida, F. alliacea, F. narthex, and F.foetida Regel and Fruricaulis Bois. However, the species like Fegalbaniflua Boiss & Buhse, yields Galbanum, and its oleo-gumresin is often mixed with 'Asafoetida' as a extraneous matter. Extracts of the oleo-gumresin and the distilled essential oil contains a number of sulphurorous compounds and they are used to limited extentas perfume fixatives.

Different Names: The asafoetida is known by different names in different languages such as; anghuzeh, angoz (Persian Farsi); asafoetida

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Afghanistan, from where it is exported to the rest of the world.

Distribution: F. assa-foetida is a monoecious, herbaceous, perennial plant, 1.5-2 m tall with a circular mass of 30–40 cm. Leaves compound, 2-4 pinnate very large and bipinnate, pubescent; segments oblong entire, obtuse. Stem base fibrous and leaves are bi-pinnately compound, umbels are not pubescent like F. assa-foetida and are up to 30 cm. Petals yellow, fruits 10-12 mm long. The Britishers were very keen to know whether Northex foetida (Ferula narthex) another source of Asafoetida, occurs in Kashmir or not. Lawrence (1895) reported that the plant was present in Doian in the Astor Tehsil (now in Pakistan). He was the first to suggest that the plant should be brought out under experimental cultivation in Astor in Kashmir (under British rule). He further mentioned that the natives use the plant in cooking (as vegetable) and the latex is used after drying as asafoetida.

Distribution: It is distributed in Afghanistan, USSR and West Pakistan, Baltistan, Boostan, Gilgit, Astore and also in Western Tibet. Earlier, the lamas (the natives of western Tibet used to collect 'asafoetida' and sell it with other Himalayan indigenous condiments. Dutt (1928) also report F. alliacea Boiss as another source, which was known in India as 'Multani heeng' and grows in Eastern Persia(Iran), Khorasan and & Kirman. It was mostly of Reddish colour and used for cooking purpose.

Various methods of extraction 'Asafoetida' from Ferula sp. in different countries:

Generally, just prior to the flowering stage the plants are cut above the ground and the taproot/rhizome exposed. A small quantity of “latex” exudes and this is collected after every few days; exposure to the air causes the latex to form first a soft exudates and then solidify, which is hard and discoloured. Some times the root is sliced every few days to produce more exudates, Coppen (1995,p.108). In Iran it is extracted from the Ferula sp. which have massive taproots or carrot-shaped roots, 12.5-15 cm in diameter at the crown when they are 4-5 years old. Just before the plants flower, in March-April, the upper part of the living rhizome root is laid bare and the stem chopped off close to the crown. A dome-shaped structure made of twigs and stone and earth to cover up the exposed surface. A milky juice exudes from the cut surface. After some days, 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 (about 3 months after the first cut). The resin is sometimes collected from successive incisions made at the junction of the stem or rhizome and the taproots.
Harvesting of oleo-gum resin from the plant is different in different countries. In Afghanistan, that root upper portion is sliced off with a sharp knife and from the cut portion exudates start oozing and it is collected after two days. The cut portion is guarded with a heap of stones to protect it from sun-heat.

Research has shown that four times incision is the best harvest method for plant productivity and growth, (Khosrogerdi 1999 quoted by Nadja et al., 2006).

**Cultivation:**
Asafoetida is native to central Asia, eastern Iran to Afghanistan, and, it is stated that it is now grown chiefly in Iran and Afghanistan, where it is extracted and processed and exported to the rest of the world.

4, *F. jaeschkeana* Vatke and its essential oil, asafetida chemical composition: Though, Lawrence (1895) for the first time reported that *F. jaeschkeana* contains pleasant celery smell. This is the only species of *Ferula* from which the asafoetida (oleo-gumresin) is extracted in India and used to adulterate the commercial Asafoetida imported from Iran and Afghanistan.


**Essential oil:** However, Husain et. al.,(1988) conducted chemical analysis of the oil yielded from the rhizome from *F. jaeschkeana*. It was thought, possibly the oil from rhizome could be used, in culinary as a condiment or spice like actual 'Heeng'. The analysis of the oil from rhizome yielded the following components employing GC-Ms-NMR and IR.: -α-pinene- 79.56%, camphene-0.97%, β-pinene 12.72%, p-cymene 0.16%, terpenolene 0.16%, linalool 0.04%, camphor 0.24%, citronellall 0.12%, borneol-0.12%, iso-bornyl acetate in traces, nerol 0.08%, anethole 0.13, iso-eugenol 0.20%, aceto-eugenol in traces and cadinene 0.19%. ( Garg et al quoted by Hussain et al (1988). But the intention to replace natural 'Heeng' in India through this oil could not be successful as they did not know that *F. jaeschkeana* is not the main source of asafoetida or Heeng and its oleo-resin, is only used to adulterate the commercial asafoetida.

The oleo-gum resin of *Asafoetida:* No doubt, that 'Heeng' is an oleo-gumresin, obtained by the 9%. The oleo-gumresin after hydrodistillation yielded a greenish yellow oil 26%. The gas chromatographic studies showed the following chemical constituents, α pinene- 48.93, camphene- 0.36%, β-pinene-12.75%, borneol traces, terpineol traces, p-cymene-0.13%, cieone- 3.78%, camphor- 0.15%, iso-borny acetate- 0.21%, nerol- 0.09%, anethole -1.15 %, camphor- 0.15%, iso bornyl acetate in traces, p-cymene- 0.77%, isoegenol- 1.2% and 1-cadinene- 2.36 %,(Kapahi et. al., 1985 quoted by Hussain et al., 1988).

**Chemistry & Pharmacology:** The Iran Asafoetida contains resin 40.65%, gum 25% and essential oil 4-20 %. The oleo-gumresin contain mainly, asa-resinotol free or combined with ferolic acid, umbeliferon free or combined. Essential oil constitute of Secondary butyl propinol disulphide, a trisulphide pinene, and the odour is due to disulphide,(Zare personal communication).

**Pharmacological, chemical & anti bacterial properties:** Arora in 1977, Sharma et. al.,(1977) enumerated the following pharmacological action of asafoetida collected from Bazar sample, stimulant, carminative, antispasmodic, expectorant, and laxative, anthelmintic, diuretic, aphrodisiac and emmenagogue and also a nervine stimulant.

The chemical compounds present are; organic sulphur compound; volatile5% containing garlic-allyl, allyl persulphide and two terpenes, a resin 65%, ferulic acid ester of asarsino-tannol; free ferulic acid; gum 25% and ash- 4% also malic, acetic, formic and valerianic acid (Sharma et al 1977,p.40). However, Gopalan et al (1996,p.71) reported Mg-80; Cu.-0.43;Mn-1.12;Zn-0.83;Cr-0.079; Protein-4.0; Fat1.1; Minerals-7.0;Phosphate-1.1;Carbohydrate67.8;Energy-460 kcal;Calcium-690 mg;Phosphorus-50 mg; Iron-39.4 mg.
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Unani medicines, where 'Asafoetida' is much used in proprietary Garga, Devisaran (1971) has mentioned a number of Ayurvedic and it is often blended with diluents such as starch and flour and sold in a currys and other food products. Since it is a strong in taste and odour so various medicinal uses of Asafoetida:

Various medicinal uses of Asafoetida: Asafoetida is used in European countries as a spice to blend and as a flavouring for meat sauces, pickles, currys and other food products. Since it is a strong in taste and odour so it is often blended with diluents such as starch and flour and sold in a compounded form.

Garga, Devisaran (1971) has mentioned a number of Ayurvedic and Unani medicines, where 'Asafoetida' is much used in proprietary medicines such as; Raj parvartini vati, Heeng Karpur vati, Heeng wustak churna, Heengvadi vati, Atisar har vati, Hysteria vati, Heeng wadi kwath, Heeng udvasakam churnam, Heengunawak churna, Heeng upanchakam churna, Heeng wadi churna of 20 types, with different crude drug composition. Similarly, three types of Heeng wadi Ghritam are available in the market along with Kayam churna.

Dymock et. al., (1890-1893, pp. pp. 233-238) had described oleo-resin as a powerful antispasmodic, expectorant, and anthelmintic, a nerve stimulant, and a feebie laxative. It useful in hysteria, and hysterical fits also in spasmodic affections such as asthma and whooping cough, angina pectoris flatulent colic, etc. It produces remarkable effects in the advanced stages of pneumonia and bronchitis in children. Heeng has been used as medicine variously in different parts of the world by different people. Honighber, (1852, p.235), who was a physician with Raja Ranjeet Singh of Panjab. He wrote, "Hakim consider the gum as a stomachic and use it to disperse induration to carry of urine and to promote menstruation and use it in diarrhea.'

In Yemen, according to Fleurentin & Pelt (1982) it is imported and used as amulet and tied in neck in cloth and it is used as an analgesic.

Various uses of the oleo-resin ‘heeng' in different parts of the world:

i. The main use of Asafoetida is as a flavouring condiment.

ii. Asafoetida is used as a tenderizer and preservative for meat was known centuries ago.

iii. It was a popular spice in Europe since the Roman times and a much-preferred spice of the Middle Ages. Iranian cuisine uses it for flavoring meat-balls, and in Afghanistan it is used in the preparation of dried meat.

iv. Its use in ancient herbal medicine dates to the seventh century B.C. The clay tablets in the library of King Assurbanipal of Assyria identified 250 vegetable drugs including Asafoetida.

v. Asafoetida emerged as a substitute for the now-extinct precious spice siphium (also called lasar) during Alexander the Great's invasion of Asia. The Roman historian recounts the discovery of Asafoetida by the soldiers of Alexander. While crossing the Hindu Kush Mountains of Afghanistan, they discovered the Asafoetida plant. Although not quite so good, it made a perfect substitute for siphium in tenderizing hard meat.

vi. It is well known that Prophet Muhammad use to treat the patients who so ever came to him and he had mentioned many plants in Quran, (Farooqi 2010), but Asafoetida is not mentioned any where?

vii. In Thailand and India, it is used to aid digestion and is smeared on the abdomen in an alcohol or water tincture. It is also said to be helpful in cases of asthma and bronchitis. A folk tradition remedy for children's colds: it is mixed into a pungent-smelling paste and hung in a bag around the afflicted child's neck.

viii. Anti microbial: Asafoetida has a broad range of uses in traditional medicine as an antimicrobial, with well documented uses for treating chronic bronchitis and whooping cough, as well as reducing flatulence.

ix. Balancing the vata and kapha. In Ayurveda, Asafoetida is considered to be one of the best condiment for balancing the vata dosha. It mitigates vata and kapha, relieves flatulence and colic pain. It is pungent taste and at the end of digestion. It aggravates pitta, enhances appetite, taste and digestion. It is easy to digest, Garga, Devisaran (1971).

x. When 'Asafoetida' reached India the physicians, like Carka & Sushruta carried out a detailed research, and adopted it as a condiment and medicine, Garga, Devisaran (1971).

xi. Antiflatulent: Asafoetida reduces the growth of indigenous microflora in the gut, reducing flatulence. Garga, Devisaran (1971) has stated numerous uses.

In India Asafoetida is used as a medicine for flatulence and constipation by 60% of locals. It is used especially by the merchant especially the
Vaishnavas and the Jainis, who avoid onion and take Asafoetida in their culinary. It is used in many vegetarian and lentil dishes to add both flavor and aroma, as well as to reduce flatulence. According to Sanjeev Kapoor, the Master Chef India, the pure 'Heeng' smell is so powerful that you can smell it from a distance of one kilometer far from the factory, where it is being processed. According to his experience one should have a good control on the quantity to be mixed to a dish.

xii. The emulsion of 'Heeng' is used as an enema. The British physicians in India regarded it as a valuable stimulant and antispasmodic in hysteria, flatulent, colic infantile convulsion, Dymock & Hooper (1890-1893,p.102).

xiii. In Khyber Pakhtoon khowa (NWFP) area of Pakistan: People hang a small bag of Asafoetida around the neck or tie it around the arm to keep safe from seasonal, bacterial and viral illnesses.

xiv. In Afghanistan: Hot water extract of the dried gum is taken orally for hysteria and whooping cough and to treat ulcers. In the Khyber Pakhtoon khowa (NWFP) area of Pakistan, people hang a small bag of asafoetida around the neck or tie it around the arm to keep safe from seasonal, bacterial and viral illnesses, the effectiveness of which might have more to do with repelling potentially infected people rather than the disease-causing organisms themselves.

xv. In China: Decoction of the plant is taken orally as a vermifuge.

xvi. In Egypt: Hot water extract of the dried root is taken orally as an antispasmodic, and as a diuretic, a vermifuge and as an analgesic.

xvii. In Malaysia: Gum is chewed for amenorrhea.

xviii. In Morocco: It is used as anti-epileptic.

xix. In Nepal: Water extract of the resin is taken orally as an anthelmintic.

xx. In Saudi Arabia: Dried gum is used medicinally for whooping cough, asthma, and bronchitis.

xxi. In United States: 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.

xxii. In Iran (Persia): It is a local stimulant to the mucous membrane, especially to the alimentary tract, and therefore it is a remedy of great value as a carminative in flatulent colic and useful addition to laxative medicine there is evidence that the volatile oil is eliminated through the lungs, therefore Asafoetida is excellent for asthma, bronchitis, whooping cough, etc., (Zargai 1991 quoted by Nadjafi et al., 2006).

Asafoetida was used as a condiment and called the "food of the gods". Not only this the herb is so highly esteemed as a condiment, it is mixed with almost all their dishes. In Iran it is sold under the name 'Asafoetida' in the market packed in 10gm, 100 gm, or 500 gm and 1 kg packets. The cost of Asafoetida is about 40-50 $ per kg. While, in India Present retail rates are Rs.15/ for 10gm. In Iran it is also used in medicine as an antispasmodic, as a pill and is recommended dose is 0.5 to 2 gram per day. In central and southern part of Iran Saplings of the plant are used as a vegetable.

xiii. In France: The gastronomers rub a little Asafoetida on hot plates from which they eat beef steaks.

xiv. In Europe: Skilful manipulation has made Asafoetida, a useful ingredient in fine perfumes. It is still regarded a valuable medicine in Europe. It is used to invoke male gods, especially those of a phallic nature. One myth claims that Asafoetida developed from the semen of a god of fertility, when it was soaked into the earth.

It is interesting to note that WHO (1999) had not mentioned this important medicinal plant in its compendium.

Import and re-export of Asafoetida from India.: Asafoetida is mainly collected from the roots of F. assa-foetida mainly in Iran and Afghanistan. According to Nadjafi et al., (2006) Iran is also main producer of Astragalus gummi-fera (Gum tragacanth); Ferula gummi-fera (Galbanum); Dorema ammoniacum (Gum ammoniac) and Ferula Asafoetida (Asafoetida gum or Heeng). The other species used are; F. persica Willd (known as Sagapenum, Sagbinaj); Erubricalis Boiss; F sambil Hook.f (sambul musk root); F. soweriana DC (sagapenum, sagbinaj). The oleo-resin is extracted from these plants in the countries, where these plants grow in wild.

The earlier records show that the Asafoetida gum has been exported from Iran since 1820 and in The year 1992 Iran produced F Asafoetida 175,734 tonnes., (Shad 1995 quoted by Nadjafi et al., 2006). And, India is the main importer of ‘Asafoetida’. In the year 1990-91 about 1000 tonnes of Asafoetida was imported into India. Present import data is not available however, it is estimated that 1500-2500 tonnes of Asafoetida is imported from Iran, Afghanistan, and Pakistan. In the year 2006, 377 tonnes of Ferula assafoetida was exported from Afghanistan apart from its local consumption, (Ottens et al., 2006).

India uses about 70% of the material in culinary and in medicine, rest it is re-exported to about 20 countries. The material is first graded from extraneous material, blended with diluents such as starch and flour and then packed and exported.

According to R. Campbell's Assyrian Herbal dated 2500, B.C. a number of herbal drugs including 'Asafoetida' and other herbal drugs were imported from India, Thorwald, (1962, p.170). Actually, the Arabian traders though collected the material from Iran, Afghanistan, etc. but sold it in Egypt as a product from India.

Banerji (1980,p.42) stated that in Matsya Purana it is stated that the “Heeng” should be kept in the Forts as an emergent material.

Genuine Asafoetida in India: It is estimated that a very large quantity of Asafoetida is used in India in the Kitchen and indigenous pharmaceutical companies in preparation of proprietary medicines as stated above. However, Fjaeschkeana Vatke found in Pakistan and India is a species, the oleo-resin is extracted but is used for adulteration. Earlier, in Iran and Afghanistan F. assa-foetida Linn; Ferula altiacea Boiss; Erubricalis Boiss, were the original sources of 'Heeng'. From Iran it was exported to West Pakistan, where it was/is blended with other

Heeng as sold for culinary purpose. In powder form in plastic or tin container(left) and solid oleo-gum resin sold in plastic bags.
oleo-resin of other *Ferula* species, which are cheaper and the material is adulterated and substituted.

According to Pruthi, (1976,p.13) a number of ‘Heeng’ varieties were considered in India such as; ‘Heeng’, ‘Heeng’ra, ‘Bandhani Heeng’ and ‘Hadda ‘Heera Heeng’ based on the species which yielded Heeng and from the country it was imported such ‘Irani Heeng’ from Iran or ‘Pathani Heeng’ from Afghanistan. Govt. of India tried to control the adulteration in food vide an Act 1954 with an amendment and amended the definition for ‘Heeng’, ‘Heeng’ra, ‘Bandhani Heeng’ is as follows:

Asafoetida (‘Heeng’ or ‘Heengra’) means the oleo-gum resin obtained from the root and rhizome of *Ferula aliaceae. Eruibracilus*, and other species of *Ferula. (F. assoafoetida)* And, there should not be any colophony resin, galbonum resin, ammoniacum or any other foreign resin. ‘Bandhani Heeng’ or compounded Asafoetida is composed of one or more varieties of *Ferula* sp. Asafoetida (Pathani Afghanistan). ‘Heeng’ is composed of gum Arabic, atta or rice flour or both it should not contain any resin or any other foreign resin coaltar dyes and mineral pigment.

Earlier there was no other way to test the Heeng sold in the bazaar except a physical test as given under:

<table>
<thead>
<tr>
<th>Quality attribute</th>
<th>‘Heeng’</th>
<th>‘Heeng’ra</th>
<th>Bandhani ‘Heeng’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total ash max)</td>
<td>15.0</td>
<td>20.0</td>
<td>10</td>
</tr>
<tr>
<td>Ash soluble in HCL % Max</td>
<td>2.5</td>
<td>8.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Alcoholic extract % (90% alcohol)</td>
<td>12.0 (Max)</td>
<td>50.0 (Max)</td>
<td>5.0 (Min)</td>
</tr>
<tr>
<td>Starch %</td>
<td>1.0</td>
<td>1.0</td>
<td>---</td>
</tr>
</tbody>
</table>

**Discussion and Conclusion**

The present study reveals that there are about 8 Ferula species which are in trade in the middle east countries as the source of Asafoetida and other the oleo-gum resin. These species mostly distributed in Iran, Afghanistan, Turkey, USSR, Tibet and Pakistan. The actual Asafoetida or Heeng producing species are; *F. assa-foetida* Lim (F. foetida Regel), *Fnarthex* and *F.aliaceae* Boiss, commonly known as the Heeng producing species.

As we have seen that Asafoetida is used in different countries for various purposes and not only used as a culinary condiment but also traditionally used to treat various diseases, including asthma, gastrointestinal disorders, intestinal parasites, etc. This oleo-gum-resin has been known to posses antifungal, anti-diabetic, anti-inflammatory, anti-mutagenic and antiviral activities. A wide range of chemical compounds including sugars, sesquiterpene coumarins and polysulphide have been isolated from oleo-gum-resin of the plant. The recent studies have shown new promising antiviral sesquiterpene coumarins from it, (Iranshahy, 2011).

The quality and flavor of Asafoetida are affected by a number of factors such as: i. The species from which it is collected and the part of the plant from which ‘Heeng’ is extracted; ii. The season of collection; iii. The method of process of preparation; iv. The nature of adulteration, etc.

However, there are other species like; *Fgalbaniflua* (Galbanum) which was earlier known in India as Gandh biroja or Gaoshir and now it is not available in India. *Eruibracilus, F.persica* (Sagapenum, Sagbinaj); *F. sumbul Hook.f (sumbul musk root); F. szovitziana DC (sagapenum, sagbinaj). The above species do not yield actual Asafoetida but other oleo-gumresin products, and some time mixed with actual Asafoetida to blend it. The Heeng sold in Indian bazaars as a gum-oleoresin is not specific F. assafoetida, F.narthex and F. aliaceae but a mixture of many *Ferula* species. As suggested earlier, it is required that the species of *Ferula* which are used to yield ‘Asafoetida’ be analysed individually.

<table>
<thead>
<tr>
<th>Pharmacological activity</th>
<th>Responsible chemical constituent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticancer</td>
<td>α-pinene; α-terpineol; diallyl-disulfide; ferulic-acid; isopimepinellin; luteolin; umbelliferone; vanillin</td>
</tr>
<tr>
<td>Anti-inflammatory</td>
<td>α - pinene; azulene; β-pinene; ferulic-acid; isopinepimellin; luteolin; umbelliferone</td>
</tr>
<tr>
<td>Antineoplastic</td>
<td>Ferulic-acid</td>
</tr>
<tr>
<td>Antitumor</td>
<td>Diallyl - sulphide; diallyl - sulphide; ferulic-acid; luteolin; vanillin</td>
</tr>
<tr>
<td>Antiviral</td>
<td>α - pinene; diallyl - disulfide; ferulic acid; luteolin; vanillin</td>
</tr>
<tr>
<td>Antibacterial</td>
<td>α-pinene; β-terpinenol; azulene; diallyl - disulfide; diallyl - sulftide ferulic-acid; luteolin; umbelliferone</td>
</tr>
<tr>
<td>Antispasmodic</td>
<td>Azulene; ferulic-acid; luteolin; umbelliferone; valeric-acid</td>
</tr>
<tr>
<td>Antiseptic</td>
<td>α-terpineol; azulene; β-pinene; diallyl - sulphide; umbeliferone</td>
</tr>
<tr>
<td>Lipoxygenase-inhibitor</td>
<td>Luteolin; umbelliferone</td>
</tr>
<tr>
<td>Antitucier</td>
<td>Azulene</td>
</tr>
<tr>
<td>Hepatoprotective</td>
<td>Ferulic-acid; luteolin</td>
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<tr>
<td>Anti-HIV</td>
<td>Diallyl - disulfide; luteolin</td>
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<tr>
<td>Antiinnotroaminic</td>
<td>Ferulic-acid</td>
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<tr>
<td>Antioxidant</td>
<td>Ferulic-acid; luteolin; vanillin</td>
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<tr>
<td>Antitaggregant</td>
<td>Ferulic-acid</td>
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<td>Tranquilizer</td>
<td>α-pinene; valeric-acid</td>
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<tr>
<td>Antiproliferative</td>
<td>Diallyl - disulfide</td>
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<tr>
<td>Apoptotic</td>
<td>Luteolin</td>
</tr>
<tr>
<td>Anticarcinogenic</td>
<td>Ferulic-acid; luteolin</td>
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<tr>
<td>D-glucuronidase-inhibitor</td>
<td>Luteolin</td>
</tr>
<tr>
<td>Immunostimulant</td>
<td>Diallyl - disulfide; ferulic-acid</td>
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<tr>
<td>Antithetapototoxic</td>
<td>Ferulic-acid; glucoronic-acid</td>
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<tr>
<td>Antiprostaglandin</td>
<td>Umbelliferone</td>
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<tr>
<td>Antihyaluronidase</td>
<td>Luteolin</td>
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<tr>
<td>Cytotoxic</td>
<td>Luteolin</td>
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<tr>
<td>Ornithine - Decarboxylase</td>
<td>Ferulic-acid</td>
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<tr>
<td>inhibitor</td>
<td></td>
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<tr>
<td>PTK-inhibitor</td>
<td>Luteolin</td>
</tr>
<tr>
<td>Sedative</td>
<td>α-pinene; α-terpineol; valeric-acid</td>
</tr>
</tbody>
</table>
and in this the scientists of Iran and Afghanistan should collect the well identified material and the Indian chemists of the National Laboratories conduct the chemical analysis of the Asafoetida and other parts of the plant and their essential oil. Presently, in India there are a few Heeng processing factories, engaged in preparing the Market-Heeng. There is no information available from Iran, Afghanistan, Turkey about the present status of wild growing and cultivated Asafoetida and the action being taken for sustainable production of Ferula species.

References


