The term 'Hyperlipidemia' denotes excessive cholesterol in the blood. It is both LDL and triglycerides that are elevated in hyperlipidemia. As per Ayurveda, In Hyperlipidemia, Medodhatu vittiates because of improper working of Parthiva and Aapbhutagni rasa and Medodhatvagni. Mainly Asthivahasrotas are affected. Asthivahasrotas build from Medo and Jaghan part. Fenugreek having lipolytic property and it primarily works on Annahvahasrotas and Asthivahasrotas. It decreases cholesterol level, reduces body weight by decreasing plasma triglycerides and having hepatoprotective effect. Fenugreek (Trigonella foenum graecum) commonly known as 'Methi', family Fabaceae is a annual plant, cultivated world wide as a semiarid crop. The seeds of fenugreek are used as condiment and dried leaves as flavouring agent. Vegetative parts are rich in vit. A, vit. B and iron. Constituents of fenugreek seeds include flavonoids, alkaloids, coumarins, saponins; most prevalent alkaloid is trigonelline and coumarins include cinnamic acid and scopoletin. In southern part of India roasted seeds in the form of infusion are indicated in diarrhoea and small pox. It is an appetizer and carminative. It’s porridge is used as galactagogue. Having antidiabetic, antiallergic, lactation induced, anti-oxidant potency. In this article we are going to discuss about fenugreek in all aspects including its Anti-hyperlipidemic action.

**KEYWORDS:** Hyperlipidemia, Medodhatu, Lipolytic, Trigonelline, Galactogogue.

**INTRODUCTION**

Fenugreek (Trigonella foenum-graecum L.) is one of the oldest medicinal plants, originating in India and Northern Africa[1]. It is native to the Mediterranean, India, China, Northern Africa and the Ukraine, as well as being widely cultivated in those locales. Cultivated commercial products in the United States come mainly from Morocco, Turkey, India and China.[2]

The genus name Trigonella, has the Latin meaning 'little triangle', owing to the triangular shape of its flowers. The species 'foenum-graecum' means 'Greek hay'. It is also known as 'ox horn' or 'goat horn' because its two seed pods project in opposite directions from the nodes of the stem base and resemble an ox or goat horns.[3]

Taxonomists such as Linnaeus noted that 18 species of Trigonella are currently in a total of 260 species. Most species, including Trigonella foenum graecum L., are diploids with 2n = 16 chromosomes. However, some species of Trigonella may include 18, 28,30, 32 or 44 chromosomes.[4]

An annual plant, fenugreek grows to an average height of two feet. The leaves and fenugreek, which mature in long pods, are used to prepare extracts or powders for medicinal use. Applications of fenugreek were documented in ancient Egypt, where it was used in incense and to embalm mummies. In modern Egypt, fenugreek is still used as a supplement in wheat and maize flour for bread-making. In ancient Rome, fenugreek was purportedly used to aid labor and delivery. In traditional Chinese medicine, fenugreek seeds are used as a tonic, as well as a treatment for weakness and edema of the legs. In India, fenugreek is commonly consumed as a condiment and used medicinally as a lactation stimulant.

There are numerous other folkloric uses of fenugreek, including the treatment of indigestion and baldness.[1] Roasted Methi grain as a coffee-substitute, particularly in Africa. It has also been used for controlling insects in grain storages and perfume industries.[3] Trigonelline compound can be used for manufacture of maple syrup and as an artificial flavour for vanilla, rum and butter scotch.[5] The possible antihyperlipidemic properties of oral fenugreek seed powder have been suggested by the results of preliminary animal and human trials. Fenugreek seeds lower serum triglycerides, total cholesterol (TC), and low-density lipoprotein cholesterol (LDL-C). These effects may be due to sapogenins, which increase biliary cholesterol excretion, in turn leading to lowered serum cholesterol levels.[1]

Abnormalities in lipid metabolism are associated with dyslipidemia, obesity, diabetes mellitus, cardiac diseases, inflammation, and their associated disorders. Current treatment of dyslipidemia, obesity, and related metabolic disorders include various modern anti-hyperlipidemic drugs which cause untoward side effects and inflict economic burden. Fenugreek seeds (FGS) are good sources of soluble dietary fiber (SDF) and their consumption have earlier been shown to bring about a significant reduction in serum and liver cholesterol levels.[6]

As per Ayurveda, Brhat Trai has not mentioned Fenugreek (Methi). Only Nighantu’s have described this valuable plant. Bhavprakash Nighantu has mentioned its
popular formulation in Vatavadyhi, as Caturbija churna
which is very effective for pain relieving conditions.[7]
Acharya Priya Vrat Sharma has quoted its medicinal use
in Vrhasaptha as leaf of Methiko is boiled in water after
adding little ghee and applied as poultice over the
abscess.[8] The leaves are refrigerant and aperient and
are given internally for vitiated conditions of ‘Pitta dosha’. [9]

**Taxonomy**[10]

Binomial name:- Trigonellafoenum-graecum Linn.

<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Plantae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super division</td>
<td>Angiosperms</td>
</tr>
<tr>
<td>Division</td>
<td>Eudicots</td>
</tr>
<tr>
<td>Class</td>
<td>Rosids</td>
</tr>
<tr>
<td>Orders</td>
<td>Fabales</td>
</tr>
<tr>
<td>Family</td>
<td>Fabaceae</td>
</tr>
<tr>
<td>Subfamily</td>
<td>Faboideae</td>
</tr>
<tr>
<td>Tribe</td>
<td>Trifolieae</td>
</tr>
<tr>
<td>Genus</td>
<td>Trigonella</td>
</tr>
<tr>
<td>Species</td>
<td>Foenum</td>
</tr>
</tbody>
</table>

**Vernacular Names**[11], [12]

<table>
<thead>
<tr>
<th>Hindi</th>
<th>Methi</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Fenugreek seed</td>
</tr>
<tr>
<td>Telugu</td>
<td>Mentulu</td>
</tr>
<tr>
<td>Kannada</td>
<td>Mentiya</td>
</tr>
<tr>
<td>Malayalam</td>
<td>Ventiyam</td>
</tr>
<tr>
<td>Bengal</td>
<td>Haenugraeb</td>
</tr>
<tr>
<td>Punjab</td>
<td>Metha</td>
</tr>
</tbody>
</table>

**Synonyms**[13]

Valli-Slender herb.

Bahupatrika - Dense foliage leaves.

Municchada- Leaves being like those of Agastya tree.

Candrika- Flowers are white or yellowish.

Kunchika- fruits are curved.

Bahubija- having numerous seeds.

Pitabija- seeds yellowish in colour.

Jatigandhapala- Aromatic seeds.

Dipani, Bodhini- It is one of the common spices which
stimulates appetite and digestion.

**Classical Review**[7, 14-18]

Bhavprakash has described ‘Methi’ in ‘Haritkyadi
varg’ and included it as one of the ingredients of
Chaturbija. Adarsh Nighantu mentioned it in ‘Palashadi
varg’. Raj Nighantu quoted it in in ‘Pippalyadivarg’. Priya
Nighantu described it in ‘Shatpushpadivarg’. Madanpal
Nighantu mentioned it in ‘Shunthyadivarg’.

**Distribution**[12, 19-20]

Fenugreek is cultivated in several parts of India as
commercial crop in Punjab and Kashmir it is wildly
propagated. It is native to Eastern Europe.

**Morphological features**[19]

A nearly smooth erect annual. Stipules not
toothed. Leaflets 2-2.5 cm. long, oblongolate-oblong,
Corolla much exerted. Pod 5-7.5 cm. long, with a long
persistent beak, often falcate, 10-20 seeded, without
transverse reticulations.

Active constituents[22]

The leaves and seeds of the fenugreek plant are
used as powders and extracts for medicine use. Fenugreek
seeds contain 45-60% carbohydrates, most of which is
amucilaginous fiber which is 30% soluble and 20%
insoluble fiber. It also contains about 20-30% proteins that
are high in lysine and tryptophan, a small amount of oils
(5-10%), a small amount of pyridine alkaloids (mostly
tronelline), and a few flavonoids, free amino acids, sapogenins, vitamins and volatile oils.

Constituents in fenugreek that are thought to be
together responsible for its hypoglycemic effects include the testa
and endosperm of the defatted seeds called the A
subfraction, the 4-hydroxyisoleucine and the fiber. It is also
thought that the saponins in the seeds are
transformed in the gastrointestinal tract into sapogenins
and this is responsible for the lipid lowering effects.

**Fenugreek leaves, raw**[21] (% Daily Value)

<table>
<thead>
<tr>
<th>Nutritional value per 100 g (3.5 oz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (205 kJ (49 kcal))</td>
</tr>
<tr>
<td>Carbohydrates (6 g)</td>
</tr>
<tr>
<td>Fat (0.9 g)</td>
</tr>
<tr>
<td>Protein (4.4 g)</td>
</tr>
<tr>
<td>Minerals</td>
</tr>
<tr>
<td>Calcium (40%)395 mg</td>
</tr>
<tr>
<td>Iron (15%)1.93 mg</td>
</tr>
<tr>
<td>Phosphorus (7%)51 mg</td>
</tr>
</tbody>
</table>

**Physical Properties**[22]

Ras-Katu

Virya- Usna

Guna-Laghu, Snigdha

Vipaka-katu

Dosha[23]- Vataghna, Kaphagha

Part Used[22]- Seeds, whole plant

Dosage[22]. Seed powder 1-3g.

**Important Formulations**[22]. PancaJirakapaka,

Methimodaka, Caturbija Curna.

**Benefits of Fenugreek**[24]

1. 25 - 100 grams of fenugreek seeds eaten daily can
 diminise reactive hyperglycemia in diabetic patients. 2.
 Fenugreek leaves and seeds help in blood formation.
 They are good for preventing anemia and rundown
 conditions.

2. Including fenugreek seed in lactating mothers
 increases the flow of milk.

3. A paste of the fresh fenugreek leaves, applied on the
 face prevents pimples, blackheads, dryness of the face
 and early appearance of wrinkles.

4. For removal of dandruff in hair.

5. If you add half a teaspoon of fenugreek seeds to the
 lentil and rice mixture while soaking, Dosas will be
 more-crisp.

**Fenugreek as potential therapeutic agent against several diseases**[25]

Apart from the usage in bakery products, frozen
dairy products, condiments, spices, pickles, and beverages,
fenugreek is known to have numerous beneficial health
effects. Gastric ulcers can easily be treated by fenugreek
seeds. The seed oil acts as an emollient and makes skin
smoother and soft. The cleansing action of fenugreek

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makes it a valuable plant; it helps purify blood, cleaning lymphatic system, and detoxify the body. In disease like hay fever and sinusitis, it can be used. The seeds are considered useful in heart disease and aphrodisiac and as a galactagogue promoting lactation.

Different regions in the world use fenugreek for different purposes; for example, in China, seeds are used to treat cervical cancer and for kidney problems. The aerial parts of plant are used to treat abdominal cramps during diarrhea in the Middle East and the Balkans. In southern India, roasted seeds are used as a treatment for dysentery. The smallpox patients are also given an infusion of seeds as a cooling agent. Being a natural health product, fenugreek is found to have the presence of fiber, greek is found to have the structure of lipid membrane and thus can be used as a cooling agent. Being a natural health product, fenugreek held an important role against the rats and mice as they were also used in vitro experiments.

Antidiabetic Activity

One of the chronic metabolic diseases is diabetes mellitus which occurs as a result of disordered metabolism of carbohydrates, proteins, and lipids. Though several forms of treatments are available in terms of medications and injectable insulin, they are accompanied with side effects. Diabetes mellitus can be regulated by the food habits which not only offer an economical approach but also are rich in chemical constituents which will help in maintaining blood glucose level. One of the well-studied herbal plants is fenugreek which has been quite researched with respect to its effect on diabetes. In one of the published studies it is documented that seeds, leaves, and its extracts are a good agent in our fight against diabetes. An active compound can also be isolated from the crude extract which can perform a beneficial role against the glucose level. One such study was done in which isolation of GII from the aqueous extract of fenugreek seeds have done. This isolated compound was able to reduce blood glucose insulin glucose tolerance test in sub diabetic and moderately diabetic rabbits. Even in Egyptian folk medicine, fenugreek held an important place as a hypoglycemic agent. Greater amount of reduction was observed using the whole seed followed by the gum isolated from cooked or uncooked seeds. The important constituents that are found to be responsible for generating the antidiabetic effects are galactomannan rich soluble fiber fraction, saponin, and an amino acid called 4-hydroxyleucine which helped in increasing insulin in hyperglycemic rats and humans.

Antioxidant Activity

Free radicals are being studied by the researchers for a long time as radicals are a source of ROS that hamper the structure of lipid membrane and thus initiate cascade of events leading to various diseases. To suppress generation of free radicals, natural products have been found as safe and effective remedy. One of the herbal extracts which is known to have antioxidant potential is fenugreek. Various studies have been done by the researchers to determine the antioxidant potential of fenugreek. In one of the experiments on rat liver to evaluate the antioxidant potential of fenugreek seeds and it was found that methanolic seed extract was able to quench the free radicals. The constituents that are understood to be responsible were flavonoids and phenolic compounds which generally marks their presence in the polar solvent system due to their self-polar nature. Thus, due to the ability of fenugreek extracts to quench the radicals, it can be a useful candidate to alleviate the harmful effects of various diseases and thus can be used for treatment purposes.

Antitumor and Anticarcinogenic Activity

The chemical constituents of fenugreek possessing anticancer activity are phytoestrogens and saponins. Saponins selectively inhibit cell division in tumor cells and also can activate apoptotic programs which can lead to programmed cell death. In one in vivo study that was carried out on rats, azoxymethane was used to induce colon cancer. The effect of fenugreek seed powder along with its bioactive compound diosgenin was checked and it was observed that both the crude extract and diosgenin were able to inhibit the formation of aberrant crypt foci (ACF) which can be observed as preneoplastic lesion. After the positive response of the extract in vivo experiment, anticancer potential of diosgenin was explored in vitro experiments. HT-29 human colon cancer cells were used and it was seen that diosgenin inhibited the proliferation of cells along with the induction of apoptosis. It is reported diosgenin to have anticancer activity in bone cancer. It suppressed cell proliferation and development of bone cells through inhibition of tumor necrosis factor Protodioscin, a furostanolsaponin isolated from fenugreek, also induces apoptotic changes leading to death in a leukemic cell line (HL-60).

Several studies on anticancer properties of chemical constituents of fenugreek have been done and have shown positive results. Some constituent of alkaloids, called “trigonelline,” has revealed potential for use in cancer therapy. Intraperitoneal administration of the extract resulted in change in number and growth pattern of ascites cells and tumor growth was also seemed to be significantly inhibited. In vitro studies of the ethanolic seed extract revealed its cytotoxic effect on a number of cancer cell lines such as breast cancer cell lines, prostate cancer cell lines, and pancreatic cancer cell lines. It is observed that fenugreek seeds in the diet inhibited colon carcinogenesis by modulating the activities of β-glucuronidase and mucinase. The seed powder in the diet decreased the activity of β-glucuronidase significantly and prevented the free carcinogens from acting on colonocytes. Mucinase helped in hydrolyzing the protective mucin. This was attributed to the presence of fiber, flavonoids, and saponins.

Hypocholesterolemic Activity

Anticholesterol activity of fenugreek extracts has been well studied by the researchers all over the world. Studies have been performed in vivo and were not limited to the rats and mice as they were also performed on different species of rabbits. A study was done to test the effects of fenugreek leaves on the cholesterol level. There
was a reduction in total blood cholesterol, LDL, VLDL level, and triglycerides and there was an increase in HDL cholesterol level after the consumption of dried fenugreek leaves in Albino rabbits. Presence of cholesterol in plasma is an indicator of coronary heart disease. Researchers have studied the effect of fenugreek seed extract on the lipid profile of plasma. Fenugreek seed administration and its extract significantly decreased plasma cholesterol, triglyceride, and LDL cholesterol. The chemical constituents responsible for the activity are saponins, specifically diosgenin, galactomannan, and fiber.

**Anti-Inflammatory Activity**

Fenugreek for past many years has been in use as a traditional medicine in several countries like Iran, southern India, and African countries as a remedy for inflammation and its related effects. The main chemical constituents responsible for the anti-inflammatory activity are alkaloids, saponins, and flavonoids. Not only seeds but also antipyretic and anti-inflammatory activity of the leaves of *T.foenum-graecum* have been reported.

**Antimicrobial Activity**

For past many years, scientists have been working on natural extracts to evaluate the antimicrobial properties for the development of novel therapeutics. Several plant systems such as *Coriandrum sativum*, *Curcuma longa*, *Citrus lemon*, and *Ocimum sanctum* have been studied by the scientists which exhibited antimicrobial action. Among various varieties of herbal extracts, fenugreek is also one of the candidates that have been tested for its activity against wide variety of microorganisms like bacteria, virus, and fungus. Secondary metabolites found in fenugreek seed extract possessed the antimicrobial activity as could be understood by various studies done by scientists. Similarly, these constituents can be found in the leaves of the fenugreek herb which can also exhibit the same property. Fungus being one of the microorganisms has also shown its sensitivity towards one of the proteins called defensin extracted from fenugreek leaves. Defensin not only inhibited the mycelial spread of *Rhizoctonia solani* but also inhibited spore germination and consequential hyphal growth of *Phaeoisariopsis*.

**Gastro protective Effect**

In addition to various kinds of extracts, researchers have tried to extract oil from fenugreek seed which also possesses pharmacological properties. One such property is gastro protective activity observed in oil extracted from fenugreek seed. The incidence of gastric ulceration, mean ulcer score, and ulcer index were found to be significantly decreased in a group of mice subjected to indomethacin to induce ulcer. The decrease in the gastric ulcer can be attributed to phytic acid, saponins, and trigonelline found in the essential oil of fenugreek. One of the studies reveals protective effect of aqueous extract of fenugreek seed against reflux esophagitis (RE) in rats and thus its potential to be used in clinical trial studies.

**Fenugreek showing Hypolipidemic effect**

Hypolipidemc Effect of Fenugreek Seeds and its Comparison with Atorvastatin on Experimentally Induced Hyperlipidemia

The fenugreek seeds contain the phenolic compounds, mainly flavonoids. An amino acid compound, 4-hydroxyisoleucine, was identified in the fenugreek extract by using an LC-MS apparatus in the positive ionization mode. The hypolipidaemic effect of the fenugreek seeds could be attributed to the presence of 4-hydroxy isoleucine, an atypical, branched chain aminoacid. The lipid lowering effect of fenugreek is due to its action on the adipocytes and the liver cells, which leads to decreased triglycerides and cholesterol synthesis in addition to an enhanced low density lipoprotein (LDL) receptor mediated LDL uptake.

**Anti-Hyperlipidemic Activity of Fenugreek (*Trigonella Foenum-graecum*) Seeds Extract In Triton And High Fat Diet Induced Hyperlipidemic Model: (A Potent Anti-Atherosclerotic Agent)**

The hypolipidemic effect of fenugreek is might be largely due to its high content of soluble fiber, which acts to decrease the rate of gastric emptying thereby delaying the absorption of lipid from the small intestine. The finding of the study reveal that the seed extract of fenugreek can effectively control the blood levels in dyslipidemic conditions by interfering with biosynthesis of cholesterol and utilization of lipids.

The effect of an ethanol extract derived from fenugreek (*Trigonella foenum-graecum*) on bile acid absorption andcholesterol levels in rats

Fenugreek has been found to contain relatively large quantities of saponins. Saponins are a heterogeneous group of amphiphilic compounds found mainly in plants. They are highly surface-active and have many diverse properties. Most saponins are haemolytic, can bind cholesterol, and form stable foams. Acruce saponin fraction isolated from fenugreek reduced serum cholesterol in rats.

**CONCLUSION**

Above article shows that fenugreek having several therapeutic properties and it cures many diseases. The consumption of fenugreek has proved safe for humans and it is used as a good dietary component as a good fibre source. As having many bio active components, fenugreek seeds have property to modulate glucose, LDL Cholesterol and triglycerides. Fenugreek seeds which were soaked in hot water for 8 weeks will significantly decreases the value of total Cholesterol, triglycerides and very low density lipo protein. Finally it can be concluded that fenugreek seeds exhibit significant hypolipidemic effect and may be useful in hyperlipidemic states. This review will be helpful to carry out more scientific investigations to prove the medicinal properties of fenugreek. Proper research studies along with planned clinical trials are the need of the present so that the natural product from the plant can produce fruitful results for society.

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