

# Therapeutic Importance of Fenugreek (*Trigonella foenum-graecum* L.): A Review

## Review article

Aher RR<sup>1</sup>, Belge SA<sup>1\*</sup>, Kadam SR<sup>1</sup>, Kharade SS<sup>1</sup>, Misal AV<sup>2</sup> and Yeole PT<sup>1</sup>

<sup>1</sup>KK Wagh College of Agricultural Biotechnology, Panchavati, Nashik, India

<sup>2</sup>PDVVPF's College of Pharmacy, Ahmednagar, India

\*Corresponding author: SA Belge, KK Wagh College of Agricultural Biotechnology, Panchavati, Nashik, India  
e-mail: shrirambelge@gmail.com

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### Abstract

Herbs have high medicinal value in Indian homes. Fenugreek (*Trigonella foenum-graecum*) is one of the most promising medicinal herbs and having nutritional value found on the continents of Asia, Europe, Africa and Australia. It is traditional remedy for treatment of various diseases. After various studies on its chemical constituents the therapeutic importance of fenugreek are known. Seeds provide the dietary fibres because of high fibre content. Fenugreek contains the gum, fibre, alkaloid, flavonoids, saponin and volatile contents. It has various therapeutic applications like antidiabetic, anticarcinogenic, hypocholesterolemia and antioxidant, antibacterial agent, hypoglycemia, gastric stimulant, and anti-anorexia agent etc. This review article summarizes the scientific literature from the databases and published experimental research. The results of this paper showed the various the therapeutic importance of fenugreek.

**Keywords:** *Trigonella foenum-graecum*; Therapeutic; Hypocholesterolemic; Flavonoids.

## Introduction

*Trigonella foenum - graecum* (L.) belonging to the family Fabaceae. It is commonly known as Fenugreek. It is native to an area extending from Iran to northern India. Fenugreek is widely cultivated in China, India, Egypt, Ethiopia, Morocco, Ukraine, Greece, Turkey, etc. [1]. India is the largest producer of fenugreek in the world. Total fenugreek production in India was 113 thousand MT in the year 2012-13 [2]. It is a flowering annual plant, with autogamous flowers. It is an aromatic, annual herb, cultivated throughout the country [3]. It is 30-60 cm tall plant, appearance of seed solid- rhomboidal, 3 to 5 cm long, 2 mm thick, hard and pebble like. Colour of seed is yellowish brown to light brown with little spicy and bitter- mucilaginous odour and taste respectively. Fenugreek is as one of the oldest cultivated medicinal plants. Many studies showed that it acquire anti-oxidant properties in seeds and leaves. It is also known as Methi. It is used as an Ayurvedic medicines in the treatment of abscesses, wounds, arthritis, bronchitis, and digestive disorders. *Trigonella foenum-graecum* (Fenugreek) plant

contains a variety of components i.e. alkaloids, glycoside, polyphenols, steroids, amino acids and volatile components. In various medicinal applications, it works as antidiabetic, anticarcinogenic, remedy for hypoglycemia and hypocholesterolemia, antioxidant, antibacterial agent, gastric stimulant, and anti-anorexia agent. The seeds are hot, with a sharp bitter taste; tonic, antipyretic, anthelmintic, increase the appetite, astringent to the bowels, cure leprosy, "vata", vomiting, bronchitis, piles; remove bad taste from the mouth, useful in heart disease [4]. Fenugreek as a chemurgic crop has a wide use for industrial purposes. Its seeds are source of a steroid diosgenin, which is used in pharmaceutical industry.

## Health benefits of fenugreek

Fenugreek seeds are used as a preservative as they are rich in vitamin E which is an antioxidant. Vitamin E protects body tissue from damage caused by substances called free radicals which can harm cells, tissue and organs. For treatment of indigestion, flatulence

**Table 1:** Chemical components present in fenugreek and their properties.

Sr. No.	Components	Property	Reference
1.	Diosgenin	Hypolipidemic and Anti-diabetic action Chemotherapeutic activity	[2, 38,39]
2.	Saponins	Hypocholesterolemic activity	[16]
3.	Flavenoids	Antioxidant activity	[40,41]
4.	Polyphenols	Antioxidant activity	[40,41]
5.	Galactoman-nan	Anti-diabetic activity	[42]

and a sluggish liver fresh leaves are used. Also the dried leaves used for flavour and for recurrent mouth ulcers the infusion of leaves are used as a gargle. For hair therapy, the fresh leaves paste is used by applying it over the scalp. It helps to hair grow, keeps natural color, makes hair silky and remove dandruff. Fenugreek seeds made in gruel and given to nursing mothers. It helps to increase the flow of milk. For skin treatment, the gelatinous texture of fenugreek seed is used to soothing the skin which is irritated by eczema in this the skin patches become rough and inflames with blisters which cause bleeding and itching. In kidney stones problem, the seeds reduce the amount of calcium oxalate. To relieve muscle aches and gout pain warm poultice/cataplasm of fenugreek is used. Fenugreek seeds help in reducing the amount of calcium oxalate in the kidneys which causes kidney stones. Now a day's fenugreek is used as source of the steroid diosgenin, one of its active constituents from which other steroids can be synthesized.

### Therapeutic importance of fenugreek

#### Fenugreek in the Treatment of Diabetes

In animal and human trials, fenugreek seeds have been found to lower fasting serum glucose levels. Fenugreek also to be used as antidiabetic remedy for both type I and II diabetes. Saponins and diosgenin present in fenugreek are responsible for hypolipidemic and anti-diabetic action [5-7]. Fenugreek is described as an antihyperglycemic herb in humans and laboratory animal [8,9].

#### Fenugreek in cancer therapy

Fenugreek is a medicinal herb for therapy in cancer patients under chemotherapeutic interventions. Fenugreek extract shows a protective effect by modifying the cyclophosphamide induced apoptosis and free radical-mediated lipid peroxidation in the urinary bladder of mice. It has been found to be potentially important in cancer treatment [5]. Flavonoids and catechins were first shown to be apoptotic in human carcinoma cells. Diosgenin present in fenugreek prevents cell growth and induced apoptosis in the H-29 human colon cancer cell line [10]. Fenugreek seed was found to have hepatoprotective properties. Polyphenolic extract of fenugreek seed acts as a protective agent against ethanol induced abnormalities in the liver [11].

#### Fenugreek as antioxidant

Fenugreek has a property as an antioxidant because of the presence of Flavenoids and polyphenols [12,13]. Fenugreek seeds rich in polyphenol which showed protective effects against hydrogen

peroxide-induced oxidation by protecting the erythrocytes from haemolysis and lipid peroxidation [14]. A recent *in vitro* study has reported that the fenugreek extract has shown and by inhibiting the  $\gamma$ -radiation induced strand break formation in plasmid pBR322 DNA [11].

#### Fenugreek effect in cholesterol lowering

The abnormal deficiency of cholesterol level in the blood is known as hypocholesterolemic problem. Fenugreek increased the fecal bile acid and cholesterol excretion. It may be secondary to a reaction between the bile acids and saponins causing the formation of micelles too large for the digestive tract to absorb. Another effect is that, the fiber-rich gum portion of the seed that reduces the rate of hepatic synthesis of cholesterol. Both this mechanism contributes to cholesterol lowering. Fenugreek seeds have hypocholesterolemic effects [15]. Hence fenugreek seeds have lowered serum cholesterol, triglyceride [16,17].

#### Fenugreek in anthelmintic activity

Seeds of fenugreek showed mark and potent anthelmintic activity. In this the alcoholic extracts showed promising results as anthelmintic activity. Besides it water extract show lesser activity [18].

#### Fenugreek in antibacterial activity

The seed extracts are effective against *Escherichia coli*, *Salmonella typhi* and *Staphylococcus aureus*. To make this aqueous extract seeds are boiled in water [18]. Fenugreek has antibacterial activity that, these plants kill bacteria according to reports [19,20]. The synthetic  $\alpha$ -glucosidases inhibitors such as acarbose can cause adverse side effects on abdomen such as abdominal distention because of excessive inhibition of pancreatic enzymes which results in the abnormal bacterial fermentation undigested carbohydrates in the colon. Therefore research on the development and utilization of anti-diabetic plants with mild inhibition of pancreatic enzymes is beneficial [21,22]. The glycolytic activity of  $\alpha$ -amylase may occur through the direct blockage of the active center at several subsites of the enzyme as also suggested for other inhibitors [21]. The fenugreek extract contains  $\alpha$ -amylase inhibitory factors which probably interact with the active sites of the enzyme in a substrate specific manner. To inhibit the growth of *Pseudomonas* spp., *E. coli*, *Shigella dysenteriae*, and *Salmonella typhi*, fenugreek is effective [23,24].

#### Fenugreek in obesity

Obesity is one of the major risk factor for morbidity and mortality. It may be defined as abnormal growth of adipose tissue [25]. In some research's it's indicated that fenugreek seed extract supplementation reduces the body and adipose tissue weight [26]. The probable mechanism of fenugreek decreasing the total body and adipose tissue weight may be that fenugreek flushes out the carbohydrates from the body before they enter the blood stream resulting in weight loss and fenugreek seeds contain a high proportion (40%) of soluble fiber. These fibers forms a gelatinous structure which may have effects on slowing the digestion and absorption of food from the intestine and create a sense of fullness in the abdomen, thus suppresses appetite and promotes weight loss [25]. Hence fenugreek is effective on blood lipids and sugar and on some bacterial strains,

antioxidant activity of fenugreek causing protective of organs and inhibition of entrance diseases to body, too decreases body fats and is effective on obesity.

### Fenugreek in Gastro protection

The fenugreek seeds are effective on gastric ulcer. The aqueous extract and a gel fraction isolated from the seeds of fenugreek showed significant ulcer protective effects. The cytoprotective effect of the seeds is due to the anti-secretory action and effects on mucosal glycoproteins. The rise in lipid peroxidation induced by ethanol is also prevented by fenugreek seeds. The mechanism besides it that it enhances the antioxidant potential of the gastric mucosa hence it can lowers mucosal injury. By various researches it can revealed that the soluble gel fraction derived from the seeds was more effective than omeprazole in preventing lesion formation. These observations show that fenugreek seeds possess antiulcer potential [22,27].

### Fenugreek influence in Digestion

Spices consumed in diet influenced the pancreatic digestive enzymes. Fenugreek prominently enhanced pancreatic lipase activity with the help of feeding rats with spicy diets for eight weeks [28]. High fibre of fenugreek helps in relieving constipation ailments.

### Fenugreek in Inflammation

The 100 and 200 mg/kg dose of fenugreek reduced carrageenan-induced paw edema in rats [29]. Fenugreek extract contains the alkaloid and it has been reported that to produce anti-inflammatory property by reducing formalin-induced edema in rat and antipyretic property by significantly reducing hyperthermia induced by Brewer's Yeast this alkaloids are essential [30]. The anti-inflammatory property of fenugreek is probably due to the presence of saponins and flavonoid. Flavonoids act as antioxidant and potential inhibitors of cyclooxygenase, lipoxygenase, and nitric oxide synthase [26,31-33].

### Fenugreek in Hypertension

Endothelial dysfunction is a devastating condition which is associated to induce various disorders such as atherosclerosis, hypertension, diabetes mellitus etc. [34]. The essential oil obtained from fenugreek in combination with other essential oils has been employed to reduce systolic blood pressure in spontaneously hypertensive rat [35]. The aqueous and benzene extract of fenugreek has been found to show diuretic activity in a dose dependent manner by increasing the volume of urine and naliuretic activity by increasing the levels of Na<sup>+</sup>/K<sup>+</sup> ions ratio in Wistar rats; which can be employed to treat hypertension [36,37].

### Conclusion

The Present review shows the different therapeutic applications of fenugreek. The major health beneficial properties of fenugreek, which can give promising therapeutic application has been discussed in this review article. Antidiabetic, antioxidant, anticarcinogenic, anthelmintic, hypocholesterolemic, antibacterial activities are the major medicinal properties of the fenugreek demonstrated in various studies. High fibre content, gummy nature and chemical constituents present in it make it a naturally health promoting herb. By studying these observations fenugreek is recommended as a safe and can be

used in daily diet.

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