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## Nutritional and health benefits of fenugreek: A short review

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### Abstract

*Trigonella foenum-graecum* (Fenugreek) is a zesty substance used to season the food, and traditionally its seeds are used as the gastric stimulant and to control diabetes. In past decade, several research studies are performed *in vitro*, on animal models, and in clinical trials to know its beneficial health effects. These include anti-oxidant effect, anti-inflammatory and antinociceptive (Seeds) activity, anti-diabetic potential, anti-inflammatory and antipyretic (Leaves), anti-ulcer (Gastro-protective) property, immunomodulatory action, anti-cancer and Renoprotective effect in diabetes. Chemical constituents present in fenugreek included soluble fiber, saponins, alkaloids, flavonoids, trigonelle, diosgenin, and 4-hydroxyisoleucine. Numerous research studies confirm the traditional uses of fenugreek in various health problems as diabetes, renoprotective in case of diabetic complications and gastric ulcers. *Trigonella foenum* has high protein content so can be used as an important protein source. In short, fenugreek has marked nutritional and medicinal values. It is the cheap, readily available substance that can be used for multipurpose.

**Keywords:** *Trigonella foenum-graecum*, nutritional value, medicinal value

### 1. Introduction

Fenugreek is an annual herbaceous plant of Leguminosae (Fabaceae) family. In different languages, it is called by different names such as Fenugrec (French), Methi (Hindi), Bockshorklee (German), Hulba (Arabian), Halba (Malaya) and K'u-Tou (China). Its seeds are used as a spice and its leaves as a vegetable. It has been used traditionally for different diseases and has a potent medicinal effect. Different civilizations used it for various purposes such as Egyptian used it as an aphrodisiac, and in various other health disorders as diabetes, dyspepsia, rickets, rheumatism, anemia, and constipation. The autochthonic system of medicine in India used it as a gastric stimulant and in treatment of anorexia [1]. Different research studies are performed to find the scientific basis of use of fenugreek in various health disorders. Numerous research studies confirm the traditional uses of fenugreek in various health problems as diabetes and gastric ulcers. In this article, these research studies are briefed.

### 2. Description

It is an annual herbaceous plant with a height of 30–60 cm. Leaves are compound pinnate trifoliate. Flowers are axillary white to yellowish. It contains 3–15 cm long thin pointed beaked pods, which contain 10–20 oblong greenish-brown seeds.

### 3. Phytochemical Constituents

A wide range of chemical constituents isolated from *Trigonella foenum graecum* including alkaloids, saponins, steroids, polysaccharides flavonoids and phenols. Moreover, it also contains soluble dietary fibers, which handle anti-hyperglycemic effects, hypolipidemic effects, and also responsible for reducing platelet aggregation as experimentally proved on the animal model by Hannan *et al.* 2003. It also contains 28% mucilage that handles inducing effect on macrophages. Among alkaloids, it contains trigonelline, choline, trimethylamine, neurin and betain alkaloids. Trimethylamine, neurin and betain alkaloids handle improving appetite by acting on the nervous system. Flavonoid content of fenugreek handles its anti-ulcer activity. Saponins are considered as the immune stimulant. Antioxidant activity is due to phenolic content.

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## 4. Pharmacological and Medicinal Properties

### 4.1 Antiradical and Antioxidant Activity

Kaviarasan studies reflect the antiradical and antioxidant activity of fenugreek seed extract. These findings showed the removal of hydroxyl radicals and inhibition of lipid peroxidation induced by hydrogen peroxide in rat liver mitochondria. These results show that fenugreek contains antioxidants and thus can prevent the cells from oxidative damage [2].

### 4.2 As a food supplement

Legumes and green vegetables are an excellent source of protein and are used as food ingredients and dietary supplements. Currently, only soya bean pods are used as a protein source. *Trigonella foenum* has high protein content (about 28%) so it can also be used as a protein source. To use the plant proteins as a food ingredient, it is necessary that they should have certain desirable characteristics. Nasri worked to find the proximate composition and physicochemical properties of a protein concentrate prepared from *Trigonella foenum*. They found that protein of *Trigonella foenum* was more soluble at acidic and alkaline pH as compared to neutral pH. Moreover, it had high oil absorption and water absorption capacity [3].

### 4.3 Anticancer Activity

*In vitro* studies of [4] show the anti-carcinogenic potential of fenugreek by inducing apoptosis in T-cell lymphoma and breast cancer cells while normal lymphocytes show no apoptosis. Their clinical study shows that the daily use of aqueous extract of fenugreek resulted in 11 years remission of relapsed primary CNS T- cell lymphoma. Thus *in vitro* and *in vivo* results are reciprocal according to their study.

### 4.4 Anti-inflammatory and Antipyretic Activity

A study [5] evaluated anti-inflammatory and antipyretic effects of fenugreek by experimenting on formalin-induced paw edema and brewer's yeast induced hyperthermia in rats. Their results show that fenugreek is more efficient in chronic administration than the single dose in reducing paw edema. In the antipyretic test, it was found that fenugreek show marked reduction of temperature 2 hours after administration and the effect of fenugreek was more potent than sodium salicylate (active control). Analgesic effects of fenugreek were also evaluated on tail flick test that is not produced by non-steroidal anti-inflammatory drugs (NSAIDs), suggests that fenugreek show an analgesic effect by some other mechanism [6]. Petroleum ether extract of fenugreek seeds evaluated for their anti-inflammatory effects on complete Freund's adjuvant-induced arthritis, formaldehyde and carrageenan-induced paw edema, and cotton pellet-induced granuloma. Results of study indicated that fenugreek reduced 85% inflammation of the paw in formaldehyde and carrageenan-induced paw edema. Moreover, fenugreek extract causes significant decrease in weight of cotton pellets in cotton pellet-induced granuloma [7].

### 4.5 Gastro-protective effect

Fenugreek proved as a potent antiulcer agent when experiments are performed in ethanol-induced gastric ulcers in rats. In this research, aqueous extract and gel fraction of fenugreek effects are compared with omeprazole that is commonly prescribed antiulcer medicine. The results show that gel fraction of fenugreek was more potent in preventing gastric lesions than omeprazole [8].

### 4.6 Anti-diabetic and its complication preventing role

Fenugreek induced hypoglycemia in normoglycemic rats in the form of aqueous extract at a dose of 0.5 to 1 g/kg body weight and methanol extract at a dose of 1g/kg body weight. It shows that active compounds are polar in nature. There are the several probable mode of actions described for inducing hypoglycemia by fenugreek but to find exact mechanism further studies are required [9].

Soluble dietary fibers in *Trigonella foenum* (tf sdf) handle the reduction of glucose level. Studies show that tf sdf has no effect on insulin secretion in single feeding as well as in chronic feeding. Along with this tf sdf decrease LDL and increase HDL secretion. Hence, tf sdf is not only responsible for combating hyperglycemia but also help to prevent dyslipidemia- risk factor of the micro and macrovascular complication of diabetes. This study shows that tf-sdf fraction effectively inhibits carbohydrate absorption in the gut. Hence, the hypolipidemic effects of the fraction could be the result of retardation of carbohydrate and fat absorption due to the presence of bioactive fiber in the agent [10]. A study reported inhibition of alpha amylase and alpha glucosidase by fenugreek in dose dependent manner in an *in vitro* study [11]. Along with anti-diabetic potential, fenugreek showed Reno-protective effects in one study. Diabetic nephropathy is a major complication of diabetes. *In vivo* studies reflected the anti-diabetic activity and Reno –protective action of fenugreek by modulating diabetes induced an alteration in kidneys, ameliorating renal filtration, kidney enlargement and glycoprotein deposition in streptozotocin-induced diabetic rats [12-14].

A triple-blind randomized controlled clinical trial showed fenugreek seeds improved glucose metabolism, adiponectin levels and serum lipid profile in studied subjects, and may be useful in the control of diabetes risk factors in Type 2 Diabetes Mellitus patients [15]. Positive Modulator of Glucagon-like Peptide-1 Receptor found in the *Trigonella foenum* seeds may be responsible for antidiabetic effects [16].

### 4.7 Immunomodulatory Action

Fenugreek showed immune stimulatory actions in Swiss albino mice at a dose of 100 mg/kg body weight. It increases bone marrow cell count thus stimulating hematopoietic stem cells of bone marrow. Moreover, it showed stimulatory effects on macrophages. Phagocytosis and killing of invading microorganisms by macrophages constitute body's primary line of defense against infections. Phagocytes play a significant role in initiation and regulation of immune response through interaction with lymphocytes. The high content of dietary fibers and mucilage handles its action on macrophages. Overall results of study indicate its immunomodulatory activity [17].

## 5. Epilogue

Fenugreek is a widely used herb in spices and medicine in India. Traditionally, it is used for diabetes and gastric stimulation. Various research studies are performed to confirm these traditional uses, and it showed not only anti-diabetic actions but also helped to prevent diabetes associated complications such as micro and macrovascular complications and diabetic nephropathy. It showed immunomodulatory action, anti-ulcer activity, antioxidant activity, antipyretic actions and anticancer activity. It can also be used a protein supplement as it has a rich content of

protein in it. Further researches should be performed on actions of fenugreek so that a cheap source of medicine will be available to the community.

## 6. Conflict of Interest

Authors declare that they have no conflict of interests.

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