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Potential health benefits of fenugreek

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Abstract

Fenugreek (*Trigonella foenum-graecum* L) commonly known as methi is an annual herb belonging to the family Papilionaceae. Fenugreek seeds are rich source of protein, minerals, vitamins, gum, fiber, alkaloid, flavonoids, saponin and volatile compounds. It is one of the most promising medicinal herbs, known from ancient times and shows antioxidant, anticarcinogenic, antidiabetic, hypocholesteromic, hypoglycemic and lactation induced properties. Recent studies have revealed that fenugreek is a valuable herb having medicinal properties and thus, can be used for preparing different products of medical importance.

Keywords: Potential health, fenugreek

Introduction

Trigonella foenum-graecum (L), commonly known as fenugreek is an annual herb belonging to the family Papilionaceae and is cultivated throughout the country (Toppo *et al.*, 2009) [23]. Fenugreek is native to Eastern Europe and parts of Asia but now widely cultivated almost all over the world for its leaves and seeds, which are commonly used as leafy vegetables and condiments, respectively (Srinivasan, 2006) [20]. The leaves and seeds of the plant are widely used as spice in food preparations and as ingredient in traditional medicine (Syeda *et al.*, 2008) [22]. Fenugreek has strong spicy and seasoning type sweet flavor (Blank, 1996). The whole seed or its ground powder is used in pickles vegetable dishes and spice powder and the dried seeds are used as condiments.

In traditional Indian medicine system, fenugreek has been used extensively for curing several disorders. India is the major producer of fenugreek and it has been mainly used for culinary and medicinal purposes. In this context, fenugreek is extensively cultivated in most regions of the world for its medicinal value (Petropoulos, 2002). Fenugreek seeds have been known and valued as medicinal material from very early times. Its seeds are considered as commercial source of a steroid diosgenin, which is of importance to the pharmaceutical industry (Mehrafarin *et al.*, 2010) [15]. The biological and pharmacological actions of fenugreek are attributed to the variety of its constituents, namely: steroids, N-compounds, polyphenolic substances, volatile constituents, amino acids, etc (Mehrafarin *et al.*, 2010) [15]. In this short review, we will summarize nutritional and medicinal properties of *Trigonella foenum-graecum* L.

Nutritional aspects of Fenugreek

Fenugreek seeds are composed of 20% to 30% protein, 45% to 60% carbohydrates (mainly the galactomannan, mucilaginous fibers in the cell walls), and 5% to 10% lipids. Other important components include pyridine-type alkaloids (mostly trigonelline), free amino acids (most notably 4-hydroxyisoleucine), saponins, and glycosides that produce upon hydrolysis steroidal saponins, such as diosgenin. The nutrient composition of fresh fenugreek leaves and mature seed is given in Table 1.

Srinivasan (2006) [20] reported that fenugreek leaves provide a good amount of various minerals and vitamins. They are especially rich in choline. Seeds are aromatic, bitter, carminative, galactagogue and antibacterial. The leaves constitute 50% unavailable carbohydrates (fiber) thus making it the richest natural source of fiber. The fiber portion consists of insoluble (30%) and soluble (20%) fraction which is mostly galactomannan (Srinivasan, 2006) [20]. Total lipids extracted from fenugreek seeds amounted to be 7.5% of the dry seeds and consisted of 84.1% neutral lipids, 5.4% glycolipids and 10.5% phospholipids. Fenugreek contains approximately 4 to 8% saponins and about 1% alkaloids, which contributing to its bitterness.

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Table 1: Composition of fresh fenugreek leaves and mature fenugreek seeds, adopted from Srinivasan (2006) [20]

Component	Leaves	Seeds
Moisture	86.0 g	-
Protein	4.4 g	30g
Fat	1.0 g	7.5 g
Fibre	1.0 g	50 g
Sapogenins	-	2 g
Trigonelline	-	380 mg
Ca	395 mg	160 mg
Mg	67 mg	160 mg
P	51 mg	370 mg
Fe	16.5 mg	14 mg
Na	76 mg	19 mg
K	31 mg	530mg
Cu	0.26 mg	33 mg
S	167 mg	16 mg
Cl	165 mg	165 mg
Mn	-	1.5 g
Cr	-	0.1 mg
Choline	1.35 g	50 mg
Vitamin C	52 mg	43 mg
Beta carotene	2.3 mg	96 µg
Thiamine	40 µg	340 µg
Riboflavin	310 µg	290 µg
Nicotinic acid	800 µg	1.1 µg
Folic acid	-	84

Values expressed per 100 g.

Mullaicharam *et al.* (2013) [16] reported that fenugreek seeds are a rich source of fiber and protein. Whole Fenugreek seeds also contain 4.8% saponins. Fenugreek seed saponins are of steroidal nature (type furostanol saponins) with diosgenin as the principal steroidal saponin. Fenugreek seeds contain alkaloids, including trigonelline, gentianine and carpaine compounds. The seeds also contain fiber fenugreekine, a component that may have hypoglycemic activity. Crude fiber is composed of cellulose, which is a complex carbohydrate composed of glucose molecules. Related to cellulose is hemicellulose - one type of hemicellulose is pectin. Lignin, another form of crude fiber, is not a carbohydrate per se, but it is of plant origin and is also indigestible. Which prevents the rapid uptake of glucose in the small intestine, slows gastric emptying, aids in blood sugar retention in diabetic patients and may also be effective in the treatment of hypercholesterolemia.

Isikli and Karababa (2005) [9] reported high proportion of protein ranging from 20 to 30% especially amino acid 4-hydroxyisoleucine in fenugreek. Meghwal and Goswami, (2012) [14] reported that fenugreek protein fraction is rich in lysine and can be compared with soybean protein. Srinivasan (2006) [20] reported that Fenugreek leaves contain vitamin C (52 mg per 100 g), β -carotene (2.3mg per 100 g), thiamine (40 µg per 100 g), riboflavin (310 µg per 100 g), nicotinic acid (800 µg per 100 g) and folic acid (0 µm per 100 g), whereas the ones for seed were 43 mg, 96 µg, 340 µg, 290 µg, 1.1 mg and 84 µg, respectively. Fenugreek seeds are rich source of soluble dietary fiber. The 100 g of seeds provides more than 65% of dietary fiber and contains saponins, hemicelluloses, mucilage, tannins and pectin, which help to decrease the level of low density lipoprotein in cholesterol (LDL) in blood by decreasing bile salts reabsorption in the colon. One of the major soluble fibers of the fenugreek seeds is galactomannan which decreases the bile salts uptake in the intestine and also

reduces the digestion and absorption of starch in body (Mathern *et al.*, 2009) [13].

Health benefits of fenugreek

Health benefits of fenugreek are attributed to its chemical composition, some minor components such as alkaloids (trigonelline, cholin, gentianine, carpaine, etc), free unnatural amino acids (4-hydroxyisoleucine), and individual spirostanols and furastanols like diosgenin, gitogenin and yamogenin.

Antidiabetic Activities

Hannan *et al.* (2007) [7] have reported that soluble fiber of fenugreek delays digestion and absorption of carbohydrate thereby improving homeostasis of glucose. Researchers have attributed this behavior to extensive gel formation and low viscosity of the resulting gels inside the intestine, delaying the gastric emptying and decreasing the intestinal transit time of the food mass. Hammerness *et al.* (2003) [6] have reported that adding 100 g fenugreek powder containing 50 percent dietary fiber for a period of 10 days decreased 25 percent blood glucose level among the type II diabetes patients. Hannan *et al.* (2007) [7] have concluded that soluble fiber had a beneficial effect on dyslipidemia and it could inhibit platelet aggregation in Type 2 model diabetic rats. Also, in an examination of 40 patients, urinary sugar and glycosylated hemoglobin were reported to reduce by 13% and 12.2%, after 8 weeks of consumption of fenugreek seed (Khorshidian *et al.*, 2016) [12].

Anticarcinogenic Activities

The anticarcinogenic activity of fenugreek has been reported in several studies. Diosgenin ($C_{27}H_{42}O_3$) found in fenugreek is starting material for the synthesis of steroid hormones such as cortisone and progesterone and has been reported to be potentially important in cancer treatment because of its ability to prevent invasion, suppress proliferation and osteoclastogenesis through inhibition of necrosis factor NF-kappa B-regulated gene expression and enhances apoptosis induced by cytokines and chemotherapeutic agents (Meghwal and Goswami, 2012) [14]. Diosgenin in fenugreek has also been reported to prevent cell growth and induce apoptosis in the H-29 human colon cancer cell line (Raju and Bird, 2006) [18]. Fenugreek has also been found to have hepatoprotective properties and polyphenolic extract of fenugreek seed has been reported to acts as a protective agent against ethanol induced abnormalities in the liver (Kaviarasan and Anuradha, 2007) [10].

Cholesterol Lowering Effect

Favier *et al.* (1995) [5] have reported a significant decrease in blood glucose, LDL cholesterol and triglycerides of 60 individuals with diabetes, high cholesterol and triglycerides level who regularly received 25 g of fenugreek fiber powder containing nearly 50 percent fiber content. Khorshidian *et al.* (2016) [12] has attributed cholesterol lowering ability of soluble fibre to bind bile acids, which are therefore excreted rather than recycled to the blood stream thus reducing blood cholesterol. Basch *et al.* (2003) [6] Basch have reported that fenugreek seeds have ability to lower serum cholesterol, triglyceride and low-density lipoprotein in hypercholesterolemia suffering patients and experimental models. Singhal *et al.* (1982) have also reported hypocholesterolemic effects of fenugreek seeds.

Hypoglycemic Activities

Hypoglycemia is a condition of human body in which there is an abnormal decrease in the sugar level of the blood. Singh and Garg (2006) [21] reported that fenugreek seeds have hypoglycemic and hypocholesterolemic effect as supported by findings during the experiments on animals. It has been reported to improve peripheral glucose utilization, contributing to improvement in glucose tolerance and exerts its hypoglycemic effect by acting at the insulin receptor level as well as at the gastrointestinal level (Meghwal and Goswami, 2012) [14].

Antioxidant Activity

Fenugreek exhibits antioxidant activity because of the presence of Flavenoids and polyphenols (Dixit et al., 2005) [4] and has been reported to show protective effects against hydrogen peroxide-induced oxidation by protecting the erythrocytes from haemolysis and lipid peroxidation (Kaviarasan et al., 2004) [11]. Balch (2003) [1] has suggested that fenugreek has powerful antioxidant property that has beneficial effect on liver and pancreas.

Lactation Aid

Fenugreek has been reported to stimulate breast milk secretion. It is speculated that fenugreek induces sweat production and since the breast is a modified sweat gland, affect breast milk secretion (Khorshidian et al., 2016) [12]. A report summarized the anecdotal account of approximately 1200 women over 6 years, who were supplemented with commercially available fenugreek. They used 2 to 3 capsules (580 or 610 mg), 3 times a day. It was reported that most women experienced an increase in milk supply within 24 to 72 hours of use (Huggins, 1998) [8].

Conclusion

Present review focuses on nutritional and health benefits of fenugreek. Fenugreek is rich in fiber, protein, and bioactive components giving it promising nutritional and health beneficial properties. Major health beneficial properties of fenugreek like antidiabetic, antioxidant, anticarcinogenic, hypoglycemic activity and hypocholesterolemic activity have been discussed in this review article. Based on the these medicinal properties, as reported by scientific findings, fenugreek can be recommended and can be made a part of our daily diet as its liberal use is safe and various health benefit can be drawn from this natural herb.

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