ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Medicinal Values of Fenugreek – A Review

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ABSTRACT

Food is a major determinant of health that is directly under our control. In fact, there is a growing consensus of individuals promoting and living a lifestyle where food is used as a form of medicine. Healthy foods, such as fresh fruits and vegetables or meats, dairy and high fiber carbohydrates, contain the full amount of vitamins and minerals required on a daily basis. Apart from helping the body perform at the optimum level, these antioxidants, vitamins, and minerals also contribute to preventing overall aging as well as chronic diseases such as cancer and heart disease Nuts and Seeds one among the natural resource contributes to the essentials in combating disease. This article highlights the use of Fenugreek in the maintenance of health

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ISSN: 0975-8585

INTRODUCTION

Science has shown multiple times that a healthy diet and lifestyle are the prime factors in overall health and wellbeing. Consuming the correct proportions of vitamins and minerals from original food sources can combat many symptoms of poor health such as extra weight, fatigue, and even many illnesses. In fact, there is a growing consensus of individuals promoting and living a lifestyle where food is used as a form of medicine. Healthy foods, such as fresh fruits and vegetables or meats, dairy and high fiber carbohydrates, contain the full amount of vitamins and minerals required on a daily basis. In addition of helping the body perform at the optimum level, these antioxidants, vitamins, and minerals also contribute to preventing overall aging as well as chronic diseases such as cancer and heart disease. A healthy diet can also thwart osteoporosis, diabetes, and as whole foods boost the total immune system, it is also possible for diet to play a strong role in preventing common colds and other routine illnesses.

Food used as a preventative to disease and as an essential part of medicine has been established for over 4000 years by physicians of natural medicine. Food is a major determinant of health that is directly under our control. We cannot always control pollution, hereditary factors, noise, environment, and the social and emotional behaviors of others, but we can certainly choose what and what not to eat. Food is so important to human existence, and because it is utilized many times each day, it has a major affect on the body. However, most people do not realize the power of foods. We hope that you will pay attention to the principles of food medicine and incorporate this natural and powerful healing component into daily living, because anything we do three times a day will have an effect on our body.

Benefits of Fenugreek [1]

1. 25 - 100 grams of fenugreek seeds eaten daily can diminish reactive hyperglycemia in diabetic patients.
2. Fenugreek leaves and seeds help in blood formation. They are good for preventing anemia and rundown conditions.
3. Including fenugreek seed in lactating mothers increases the flow of milk.
4. A paste of the fresh fenugreek leaves, applied on the face prevents pimples, blackheads, dryness of the face and early appearance of wrinkles.
5. For removal of dandruff in hair.
6. If you add half a teaspoon of fenugreek seeds to the lentil and rice mixture while soaking, dosas will be more-crisp.

Preparation and Storage [3]

Dried seeds should be lightly roasted before using (don't overdo it though, or they will become bitter). After roasting, they are easily ground. A small amount will complement many other spices, but too much can be overpowering. If the seeds are required as part of a curry paste they can be soaked overnight to swell and soften, and be easily mixed with the other ingredients.

ISSN: 0975-8585

FENUGREEK: - Trigonella foenum-graecum L.
Family: Fabaceae (Leguminosae)
Other Names [1, 2]

Various names of Fenu Greek in different languages	
Language	**Names**
French	Fenugrec Sénegré, Trigonell
German	Bockshornklee, Griechisches Heu
German- Italian	Fieno Greco
Spanish	Alholva, Fenogreco
Indian	Mayti, Methe, Methi
Indian-Tamil	Venthium
Malay	Alba
Sinhalese	Uluhaal

Habitat and Cultivation [3, 4]

Native to North Africa and countries bordering the eastern Mediterranean, fenugreek grows in open areas and is widely cultivated, notably in India. Fenugreek requires well-drained, good soil of medium texture. Tolerated pH range is 5.3 to 8.2. Seeds are sown directly in the garden in spring, as soon as the danger of frost is past. The plant reaches a height of 0.3 to 0.8 meters and has trifoliate leaves. White flowers appear in early summer and develop into long, slender, yellow-brown pods containing the brown seeds of fenugreek commerce.

The reported life zone of fenugreek is 8 to 27 degrees centigrade with an annual precipitation of 0.4 to 1.5 meters and a soil pH of 5.3 to 8.2). The plant thrives in full sun on rich, well-drained soils. Growth is slow and weak in cold temperatures and wet soils. As a leguminous plant, fenugreek needs little if any nitrogen fertilizer, and the plant can enrich soils with nitrogen. . The plant is quite nutritious, being high in proteins, ascorbic acid, niacin, and potassium. There is considerable commercial interest in breeding and growing fenugreek cultivators high in sapogenins.

Spice Description [5]

Fenugreek is the small stony seeds from the pod of a bean-like plant. The seeds are hard, yellowish brown and angular. Some are oblong, some rhombic, other virtually cubic, with a side of about 3mm (1/8”). A deep furrow all but splits them in two. They are available whole and dried, or as a dull yellow powder, ground from the roasted seeds.

Chemical Constituents

Diosgenin, a steroid sapogenin found in fenugreek is the starting compound for over 60% of the total steroid production by the pharmaceutical industry Other sapogenins found in fenugreek seed include yamogenin, gitogenin, tigogenin, and neotigogens Fenugreek seeds contain alkaloids, including trigonelline, gentianine and carpaine compounds. The seeds also

contain fiber, 4-hydroxyisoleucine and fenugreekine, a component that may have hypoglycemic activity. Other constituents of fenugreek include mucilage, bitter fixed oil, volatile oil, and the alkaloids choline and trigonelline Extract of fenugreek is obtained by alcoholic extraction.

The chemical composition of Fenugreek seeds and defatted Fenugreek seeds is given in Table 1. These seeds are a rich source of fiber and protein. The fiber may be further classed as gum (gel fiber) and neutral detergent fiber. 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.

Table 1: Proximate Composition (%) of Fenugreek Seeds [6]

Component	Whole Seeds	Defatted Seeds
Moisture	9.0	9.0
Ash	3.0	3.5
Lipids	8.0	Negligible
Protein	26.0	28.3
Starch	6.0	6.5
Total Fiber	48.0	51.7
Gum	20.0	19.2
Neutral Detergent Fiber	28.0	32.5

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 molecule 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.

Research work on Chemical constituents of the stems and leaves of Trigonella foenum-graecum L

Two compounds were isolated from the leaves and stems of Trigonella foenum-graecum, and on the basis of spectral analysis, their structures were elucidated as gamma-schizandrin and scopoletin. They were isolated from T. foenum-grecum for the first time [7].

MEDICINAL USES [8]:-

Fenugreek has a long history of medical uses in Ayurvedic and Chinese medicine, and has been used for numerous indications, including labor induction, aiding digestion, and as a general tonic to improve metabolism and health. Preliminary animal and human trials suggest possible hypoglycemic and anti-hyperlipidemic properties of oral fenugreek seed powder.

Fenugreek Seeds are aromatic, bitter, carminative, galactogouge, antibacterial and may be eaten raw or cooked. Fenugreek is a digestive aid. As an emollient it is used in poultices for boils, cysts and other complaints. Reducing the sugar level of the blood, it is used in diabetes in conjunction with insulin. It also lowers blood pressure. Fenugreek relieves congestion, reduces inflammation and fights infection. Fenugreek contains natural expectorant properties ideal for treating sinus and lung congestion, and loosens & removes excess mucus and phlegm. Fenugreek is also an excellent source of selenium, an anti-radiant which helps the body utilize oxygen. Fenugreek is a natural source of iron, silicon, sodium and thiamine. Fenugreek contains mucilagins which are known for soothing and relaxing inflamed tissues. Fenugreek stimulates the production of mucosal fluids helping remove allergens and toxins from the respiratory tract. Acting as an expectorant, Fenugreek alleviates coughing, stimulates perspiration, and is beneficial for treating allergies, bronchitis and congestion. In the East, beverages are made from the seed to ease stomach trouble. The chemical make-up is curiously similar to cod liver oil, for which a decoction of the seed is sometimes used as a substitute. Many other properties are ascribed to it in India and the East and not surprisingly include aphrodisiac.

Fenugreek is often used in herbal medicine in North Africa, the Middle East, and India, being esteemed as a remedy for a wide variety of conditions. The nourishing seeds are given during convalescence and to encourage weight gain, especially in anorexia. They are also helpful in lowering fever, with some authorities comparing their ability to that of quinine. The seeds' soothing effect makes them of value in treating gastritis and gastric ulcers. They are used to induce childbirth and to increase breast-milk production. Fenugreek is also thought to be anti-diabetic and to lower blood cholesterol levels. Externally, the seeds may be applied as a paste to treat abscesses, boils, ulcers, and burns, or used as a douche for excessive vaginal discharge. The seeds also freshens bad breath and help restore a dulled sense of taste. In China, fenugreek is used as a pessary to treat cervical cancer uterine contractions.

Research work on the Fenugreek:

Therapeutic potential of Fenugreek [15- 39]

Fenugreek (Trigonella foenum-graecum) being rich in phytochemicals has traditionally been used as a food, forage and medicinal plant. Fenugreek seeds contain lysine and L-tryptophan rich proteins, mucilaginous fibre and other rare chemical constituents such as saponins, coumarin, fenugreekine, nicotinic acid, sapogenins, phytic acid, scopoletin and trigonelline, which are thought to account for many of its presumed therapeutic effects. Various components of the seeds have varying activities. For example, the component called fenugreekine, a steroidal sapogenin peptide ester has hypoglycemic properties. It is shown to delay gastric emptying, slow carbohydrate absorption, and inhibit glucose transport in humans. It can increase the erythrocyte insulin receptors and peripheral glucose utilization, thus showing improved pancreatic function. Trigonelline, another component is suggested to exert hypoglycemic effects in healthy patients without diabetes. Thus the best documented medical use of fenugreek is to control blood sugar in both insulin-dependent (type 1) and noninsulin - dependent (type 2) diabetics. Treatment with fenugreek. Seed powder normalized the

enhanced lipid peroxidation and increased susceptibility to oxidative stress associated with depletion of antioxidants in diabetic rats. In normal rats supple-mentation resulted in increased antioxidant status with reduction in peroxidation. The steroidal saponins (diosgenin, yamogenin, tigogenin and neotigogenin) are thought to inhibit cholesterol absorption and synthesis and hence its potential role in arteriosclerosis. Clinical studies demonstrated a statistically significant decline in human serum total cholesterol, triglycerides and LDL cholesterol by fenugreek consumption. It is also used topically to treat inflammation, and to promote postpartum lactation in animals. The beneficial gastroprotective effect of fenugreek seeds has been researched in gastric ulcers of rats. There is considerable commercial interest in growing fenugreek for its high sapogenin content. At present diosgenin, a steroid sapogenin used in the manufacture of birth control pills is isolated from Dioscorea species. This is the starting compound for over 60% of the total steroids, hormones and cortisone production by the pharmaceutical industry. Fenugreek being an annual and easy to cultivate might one day replace the present commercial sources. Plant phenolics have potential health benefits mainly due to their antioxidant properties such as reactive oxygen species (ROS) scavenging and inhibition, electrophile scavenging and metal chelation. Epidemiological studies support a relationship between the consumption of phenolic rich food products and a low incidence of coronary heart disease, atherosclerosis, certain forms of cancer and stroke. They have also been reported to exhibit pharmacological properties such as antitumor, antiviral, antimicrobial, anti-inflammatory, hypotensive and antioxidant activity.

Estrogenic Potential of Fenu Greek Seeds [10]

A recent study (June 2011) by the Centre for Integrative Clinical and Molecular Medicine in Australia revealed that fenugreek seeds) contain phyto-chemicals, saponins which may have an effect on the production of sex hormones and may help the body maintain normal testosterone levels.

Anticancer Potential of Fenu Greek Seeds [11, 12]

Recent studies suggest that fenugreek and its active constituents may possess anticarcinogenic potential. We evaluated the preventive efficacy of dietary fenugreek seed and its major steroidal saponin constituent, diosgenin, on azoxymethane-induced rat colon carcinogenesis during initiation and promotion stages. On the basis of these findings, the fenugreek constituent diosgenin seems to have potential as a novel colon cancer preventive agent.

Trigonella foenum graecum (fenugreek) seed extract as an antineoplastic agent: The antineoplastic effect of Trigonella foenum graecum seed extract has been evaluated in the Ehrlich ascites carcinoma (EAC) model in Balb-C mice. Intra-peritoneal administration of the alcohol extract of the seed both before and after inoculation of EAC cell in mice produced more than 70% inhibition of tumour cell growth with respect to the control. Treatment with the extract was found to enhance both the peritoneal exudate cell and macrophage cell counts. The

extract also produced a significant antiinflammatory effect. We report here the antiinflammatory and antineoplastic effects, of Trigonella foenum graecum seed extract [13].

Antioxidant potential & Reduction of Ethanol Toxicity of Fenu Greek Seeds [21]

Crude extracts of fenugreek were prepared by soxhelt extraction method with different solvents such as methanol, ethanol, dichloromethane, acetone, hexane and ethyl acetate. Extracts were subjected for the measurement of total phenolic content (TPC) by Folin-Ciocalteu method as well as flavonoid content, chelating activity, reducing power and antioxidant/radical scavenging activity [1,1-diphenyl-2-picryl-hydrazyl (DPPH°) free radical scavenging activity]. Results from different parameters were in agreement with each other. The results reveal that all extracts of the fenugreek exhibit antioxidant activity. These findings suggest that the fenugreek extracts could act as potent source of antioxidants.

Antidiabetic potential Fenugreek Leaves [16-17]

Antidiabetic potential Fenugreek may increase the number of insulin receptors in red blood cells and improve glucose utilization in peripheral tissues, thus demonstrating potential anti-diabetes effects both in the pancreas and other sites. The amino acid 4- hydroxyisoleucine, contained in the seeds, may also directly stimulate insulin secretion.

Moreover, 4-hydroxyisoleucine did not interact with other agonists of insulin secretion (leucine, arginine, tolbutamide, glyceraldehyde). Therefore, we conclude that 4-hydroxyisoleucine insulinotropic activity might, at least in part, account for fenugreek seeds' antidiabetic properties. This secretagogue may be considered as a novel drug with potential interest for the treatment of NIDDM [18].

Antinociceptive effects of Trigonella foenum-graecum leaves extract [19].

There are some reports concerning the antinociceptive effects of the plant Trigonella foenum-graecum (TFG) in Iranian traditional medicine. Because of the side effects of nonsteroidal anti-inflammatory and antinociceptive drugs, and in search for more potent and less harmful compounds, study of the antinociceptive effects of TFG leaves by using tail-flick and formalin tests were carried out. Intraperitoneal (i.p.) administration of 500 mg/kg of TFG extract and 100 and 300 mg/kg of sodium salicylate (SS), as a positive control, did not show any effect in the tail-flick test, but the 1000 and 2000 mg/kg of the extract produced significant increase in the tail-flick latency. We conclude that: (1) the extract of TFG leaves produces antinociceptive effects through central and peripheral mechanisms; (2) the antinociceptive effects of 2000 mg/kg of the extract was more potent than 300 mg/kg of SS.

In vitro anti-plasmodial activity of Trigonella foenum-graecum [23]

Developing countries, where malaria is one of the most prevalent diseases, still rely on traditional medicine as a source for the treatment of this disease.. The active principle was

extracted out in different solvent systems to assess the anti-plasmodial potential, with an aim that they can further be utilized to formulate drugs. In vitro anti-plasmodial assay of the extracted fractions of fenugreek leaves was carried out using laboratory adapted chloroquine sensitive and resistant Plasmodium falciparum isolates. Schizont maturation inhibition assay was adopted to analyze the potential of the extracts. Ethanol extract (50%) seemed to possess profound anti-plasmodial activity with IC(50) value of 8.75 +/- 0.35 micro g ml(-1) and 10.25 +/- 0.35 micro g ml(-1) against chloroquine sensitive and resistant P. falciparum isolates, respectively. Among the investigated six fractions of the plant extracts, two were found to have significant anti-plasmodial activity with IC(50) values <10 micro g ml(-1), namely ethanol and butanol extracts. Two extracts chloroform and ethyl acetate showed moderate activity with IC(50) values ranging from 10 to 20 micro g ml(-1), and the other two extracts, hexane and water appeared to be inactive with IC(50) values >85 micro g ml(-1). In addition, preliminary phytochemical screening of the various extracts indicated the presence of alkaloids, saponin, tannin like phenolic compounds, flavonoids and steroids.

Gastroprotective effect of fenugreek seeds (Trigonella foenum graecum) on experimental gastric ulcer in rats [24]

The effect of fenugreek seeds (Trigonella foenum graecum) compared to Omeprazole was studied on ethanol-induced gastric ulcer. The aqueous extract and a gel fraction isolated from the seeds showed significant ulcer protective effects. The cytoprotective effect of the seeds seemed to be not only due to the anti-secretory action but also to the effects on mucosal glycoproteins. The fenugreek seeds also prevented the rise in lipid peroxidation induced by ethanol presumably by enhancing antioxidant potential of the gastric mucosa thereby lowering mucosal injury. Histological studies 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.

Side Effects and Cautions

Because of fenugreek's estrogen content and its ability to stimulate the uterus, you should avoid this herb if you are pregnant. Fenugreek lowers blood sugar levels, and has been used experimentally as an oral insulin substitute. If you are diabetic, you should be aware that consuming fenugreek might interfere with your insulin therapy.

As some authorities suggest that fenugreek's high mucilage content could coat the stomach and reduce absorption of prescription medications, you should limit your consumption of fenugreek if you are taking medication.

CONCLUSION

The various scientific reports showed that Fenugreek, known for its hypoglycemic, anti-inflammatory and immunomodulatory activity, may be a promising protective medicinal herb for consideration in complementary therapy in cancer patients under chemotherapeutic

interventions. This review will be helpful to carry out more scientific investigations to prove the medicinal properties of fenugreek in human volunteers.

REFERENCES

[1] http://cms.herbalgram.org/membersaccess.html
[2] Thirunavukkarasu V, Anuradha CV, Viswanathan P. Protective effect of fenugreek (Trigonella foenum graecum) seeds in experimental ethanol toxicity. Phytother Res. 2003;17(7):737-43.
[3] http://kellymom.com/bf/can-i-breastfeed/herbs/fenugreek/
[4] Basch E, Ulbricht C, Kuo G, Szapary P, Smith M. Therapeutic applications of fenugreek. Altern Med Rev 2003; 8(1):20-7.
[5] http://medicinalherbinfo.org/herbs/Fenugreek.html
[6] Daniel Zohary and Maria Hopf, Domestication of plants in the Old World, third edition (Oxford: Oxford University Press 2000; 122.
[7] Zhongguo Zhong Yao Za Zhi. Chemical constituents of the stems and leaves of Trigonella foenum-graecum L1997; 22(8):486-7, 512.
[8] Toshiyuki MURAKAMI, Akinobu KISHI, Hisashi MATSUDA, and Masayuki YOSHIKAWA Medicinal Foodstuffs. XVII.1) Fenugreek Seed. Chem Pharm Bull 2000; 48(7): 994—1000
[9] http://www.pubmedcentral.nih.gov
[10] Shang M, Cai S, Han J, Li J, Zhao Y, Zheng J, Namba T, Kadota S, Tezuka Y, Fan W. Zhongguo Zhong Yao Za Zhi. Studies on flavonoids from Fenugreek (Trigonella foenumgraecum L 1998; 23(10):614-6, 639.
[11] http://www.niscair.res.in/sciencecommunication/abstractingjournals/MAPA/mapa2k5/mapa_dec05.asp
[12] http://www.ncbi.nlm.nih.gov/pubmed/12774372
[13] www.ncbi.nlm.nih.gov/pubmed/16381462
[14] McGuffin M, Hobbs C, Upton R, Goldberg A. American Herbal Product Association's Botanical Safety Handbook. Boca Raton: CRC Press, 1997.
[15] http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl.
[16] Leung AY, Foster S. Encyclopedia of Common Natural Ingredients Used in Food, Drugs, and Cosmetics. 2nd ed. New York, NY: Wiley; 1996:243-244.
[17] Raju J, Patlolla JM, Swamy MV, Rao CV. Diosgenin, a steroid saponin of Trigonella foenum graecum (Fenugreek), inhibits azoxymethane-induced aberrant crypt foci formation in F344 rats and induces apoptosis in HT-29 human colon cancer cells. Cancer Epidemiol Biomarkers Prev. 2004; 13(8):1392- 8.
[18] http://www.intelihealth.com/IH/ihtIH/WSIHW000/8513/31402/347265.html?d=dmtContent
[19] www.ncbi.nlm.nih.gov/pubmed/11351364
[20] www.ncbi.nlm.nih.gov/pubmed/12469212
[21] Flammang AM, Cifone MA, Erexson GL, Stankowski LF Jr , Genotoxicity testing of a fenugreek extract. Food Chem Toxicol 2004; 42(11):1769-75.
[22] http://globalinc.prod.ehc.com/containers/ebsco/ebsco_detail.dot?id=21712&lang=English&format=full&db=hlt

[23] Sharma RD, Raghuram TC, Rao NS. Effect of fenugreek seeds on blood glucose and serum lipids in type I diabetes. Eur J Clin Nutr 1990; 44:301-306.
[24] www.ncbi.nlm.nih.gov/pubmed/9519714
[25] www.naturalstandard.com/databases/fenugreek
[26] www.ncbi.nlm.nih.gov/pubmed/9519714
[27] Panda S, Tahiliani P, Kar A. Inhibition of triiodothyronine production by fenugreek seed extract in mice and rats. Pharmacol Res. 1999; 40(5):405-9.
[28] Zia T, Siddiqui IA, Nazrul-Hasnain Nematicidal activity of Trigonella foenum-graecum L Phytother Res 2001; 15(6):538-40.
[29] M Palaniswamy, BV Pradeep, R Sathya and J Angayarkanni. In Vitro Anti-plasmodial activity of Trigonella foenum–graecum L. Evid Based Complement Alternat Med 2010; 7(4): 441–445.
[30] www.ncbi.nlm.nih.gov/pubmed/12127242
[31] www.ncbi.nlm.nih.gov/pubmed/12586606
[32] Kassem A, Al-Aghbari A, AL-Habori M, Al-Mamary M. Evaluation of the potential antifertility effect of fenugreek seeds in male and female rabbits. Contraception. 2006;73(3):301-6. Epub 2005 Nov 2.
[33] www.ncbi.nlm.nih.gov/pubmed/16828947
[34] Ikeuchi M, Yamaguchi K, Koyama T, Sono Y, Yazawa K. Effects of fenugreek seeds (Trigonella foenum greaecum) extract on endurance capacity in mice. J Nutr Sci Vitaminol (Tokyo) 2006; 52(4):287-92.
[35] Laroubi A, Touhami M, Farouk L, Zrara I, Aboufatima R, Benharref A, Chait A. Prophylaxis effect of Trigonella foenum graecum L. seeds on renal stone formation in rats. Phytother Res 2007; 21(10):921-5.
[36] www.niscair.res.in/sciencecommunication/.../mapa_apr07.asp
[37] en.wikipedia.org/wiki/Fenugreek
[38] www.ncbi.nlm.nih.gov/pubmed/2819947
[39] TC Raghuram, RD Sharma, S Pasricha, KK Menon and G Radhaiah. Glycaemic Index of Fenugreek Recipes and Its Relation to Dietary Fiber. Int J Diab Dev Countries 1992; 12:1-4.