CHAPTER 34

Potential Health Benefits of Fenugreek Leaves

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SUMMARY

Methi or fenugreek leaves are the leafy parts of the fenugreek plant and are known for their unique, slightly bitter taste. Fenugreek is a crop that originated in Eastern Europe and parts of Asia, such as Turkey, Egypt, and India. Its leaves are used in traditional medicine, and its seeds are used to flavor food. Fenugreek leaves are rich in important vitamins and minerals that have a major positive impact on health. Fenugreek is a natural food additive and traditional medicine and has been demonstrated to have strong antidiabetic, antioxidant, anti-carcinogenic, and anti-inflammatory properties. This chapter discusses the potential health benefits of fenugreek. Significant ingredients of fenugreek include iron for oxygen transport, calcium and magnesium for strong bones, and vitamin C for immune support. In addition, the leaves contain advantageous phytochemicals that may be good for your health, such as modified amino acids, flavonoids, and alkaloids. Fenugreek leaves benefits include bettering respiratory health, digestion, and even lactation support for nursing moms. Fenugreek leaves are an essential ingredient in Middle Eastern and Indian cooking, giving food taste and nutrients. Herbal preparations that harness their therapeutic benefits include teas and extracts. However, fenugreek leaves can upset some people's stomachs, trigger allergic reactions, or result in hypoglycemia.

INTRODUCTION

Fenugreek leaves (*Trigonella foenum-graecum*), also known as methi leaves (Urdu), are the foliage of the fenugreek plant, a member of the Fabaceae family (Toppo et al., 2009). The plant leaves are used fresh or dried to add a distinctive, slightly bitter flavor to dishes, yet this distinctive flavor finds its essence in Italian cuisine. Fenugreek is an annual plant that propagates through seeds. The taste and smell of fenugreek resemble those of burnt sugar. The bitter taste of fenugreek reduces when it is exposed to heat. Roasted fenugreek is an excellent substitute for coffee (Srinivasan, 2006).

The leaves of the fenugreek plant are small and delicate, with a distinctive shape that resembles clover or shamrocks. Fenugreek leaves are often used in traditional medicine to treat a variety of health conditions. They are believed to have anti-inflammatory properties (Bhatt et al., 2021), and may help to improve digestion, regulate blood sugar levels, and support respiratory health (Olaiya & Olugboyega 2014). They are also sometimes used as a natural remedy for lactation problems in breastfeeding mothers (Syeda et al., 2008).

HABITAT

Fenugreek leaves originate from Eastern Europe and certain regions of Asia, including countries such as Turkey, Egypt, and India. While the seeds and leaves were traditionally used in these areas, fenugreek cultivation has expanded globally. It is widely grown for its medicinal properties in this context throughout the majority of the globe. The fenugreek plant can grow up to 20 inches (51 cm) tall, its seeds are used for seasoning dishes. The seeds grow in pods, with about 20 seeds in each. These tender pods, the leaves, and the shoots can also be used as vegetables (Mehrafarin et al., 2010). Presently, fenugreek leaves are cultivated in a multitude of countries spanning various continents. This includes nations like China, Morocco, Ethiopia, and Iran, showcasing the versatility and adaptability of this plant as it thrives in diverse climates and geographical conditions (Srinivasan, 2006).

NUTRIENT PROFILE OF LEAVES

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They emerge as a valuable reservoir of essential vitamins and minerals that contribute significantly to overall health. Notable among these are vitamin C, which boosts the immune system, iron, which aids in oxygen transport and calcium and magnesium, which promote bone strength (Al-Jasass & Al-Jasser 2012). In addition to these nutritional elements, fenugreek seeds harbor a diverse array of constituents, rendering them multifaceted agents of wellness. Within fenugreek seeds, one can unearth a trifecta of vital macronutrients. Protein, constituting 20% to 30% of the seed's composition, plays an integral role in tissue repair and growth (Leela & Shafeekh 2008). Complementing this, lipids are present in the range of 5% to 10%, contributing to energy storage and cell membrane integrity. The carbohydrate content, which encompasses 45% to 60% of the seed, predominantly comprises galactomannan–mucilaginous fibers entrenched within cell membranes (Isikli & Karababa 2005). Tab 1. highlights the distinctive nutritional profiles of fenugreek leaves and seeds, showcasing their diverse components.

SECONDARY METABOLITES

The chemical composition of fenugreek is credited with housing several minor components that are associated with potential health benefits. These constituents include alkaloids like trigonelline, choline, and gentianine. Moreover, fenugreek contains flavonoids such as quercetin, rutin, and vitexin, compounds renowned for their antioxidant properties and potential health-boosting effects. A notable presence in fenugreek's chemical makeup is that of modified amino acids, particularly 4-hydroxy isoleucine, which has gained attention for its potential role in enhancing insulin secretion and metabolic health (Kaviarasan & Anuradha 2007). Additionally, fenugreek showcases individual spirostanols and furostanols, including diosgenin, gitogenin, and yamogenin (Naika et al., 2022). These compounds contribute to fenugreek's diverse phytochemical profile, potentially adding to its therapeutic significance. Notably, fenugreek is rich in saponins, with diosgenin as a significant component. Saponins, including diosgenin, have been implicated in various physiological effects, ranging from hormonal modulation to cholesterol management (Basch et al., 2003).

HISTORICAL AND CULTURAL USAGE IN HEALING PRACTICES

Fenugreek leaves have a rich history in healing practices. They originate from Eastern Europe and certain regions of Asia, including countries such as Turkey, Egypt, and India. While the seeds and leaves were traditionally used in these areas, fenugreek cultivation has expanded globally. Presently, fenugreek leaves are cultivated in a multitude of countries spanning various continents. This includes nations like China, Morocco, Ethiopia, and Iran, showcasing the versatility and adaptability of this plant as it thrives in diverse climates and geographical conditions (Srinivasan, 2006).

PHYTOCHEMICAL CONSTITUENTS AND THERAPEUTIC POTENTIAL

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Tab 1. Composition of mature fenugreek seeds and fresh fenugreek leaves, (values expressed per 100g), adopted from Srinivasan (2006).

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

potential health-boosting effects. A notable presence in fenugreek's chemical makeup is that of modified amino acids, particularly 4-hydroxy isoleucine, which has garnered attention for its potential role in enhancing insulin secretion and metabolic health (Kaviarasan & Anuradha 2007).

TRADITIONAL HEALING SYSTEMS

Fenugreek leaves have a significant presence in traditional healing systems like Ayurveda, Traditional Chinese Medicine, and indigenous practices. They have been employed for various purposes, including improving digestion and supporting respiratory health (Srinivasan, 2006). Scientific research supports the health benefits of fenugreek leaves. They have been studied for their potential to regulate blood sugar levels, reduce inflammation, support lactation, and more (Khorshidian et al., 2016).

ANTI-DIABETIC ACTIVITIES

Fenugreek's soluble fiber slows down the breakdown and uptake of carbohydrates, enhancing glucose homeostasis. Patients with type II diabetes who consumed 100 g of fenugreek powder with 50% dietary fiber for 10 days saw a 25% reduction in blood glucose levels. In Type 2 diabetic rodents, soluble fiber reduced dyslipidemia and was able to prevent platelet aggregation (Hannan et al., 2007).

Fenugreek beans are notable for their high protein and fiber content, making them a valuable addition to various diets. The seeds, encompassing a considerable 4.8% saponin content, particularly feature diosgenin as a key steroidal saponin of the furostanol variety. These seeds also house alkaloids like trigonelline, gentianine, and campaign chemicals, while the presence of fenugreek fiber suggests potential hypoglycemic properties. Meghwal & Goswami (2012) reported that fenugreek's composition is even more complex due to the presence of cellulose, a complex carbohydrate made up of glucose molecules, and hemicellulose, which contains pectin. These components together demonstrate the complex range of nutrients and bioactive compounds that are present in fenugreek's genetic makeup.

Although lignin, another type of crude fiber, is not a carbohydrate per se, it is a product of plants and is indigestible. As a result, it slows gastric emptying, helps diabetic patients retain blood sugar, and may also be useful in the treatment of hypercholesterolemia (Dixit et al., 2005).

ANTICANCER ACTIVITIES

Fenugreek has been shown to have anti-carcinogenic properties due to its capacity to inhibit necrosis factor kappa, β-regulated gene expression, inhibit osteoclastogenesis, and enhance apoptosis brought on by cytokines and chemotherapeutic agents, diosgenin, a substance found in fenugreek, has been reported to be potentially important in the treatment of cancer. These steroid hormones include cortisone and progesterone (Raju & Bird 2006). Fenugreek's diosgenin has also been shown to inhibit cell development and trigger apoptosis in the human colon cancer cell line H-29. Additionally, fenugreek has been discovered to have hepatoprotective qualities, and a polyphenolic extract of fenugreek seed has been claimed to work as a preventative against ethanol-induced abnormalities in the liver (Kaviarasan & Anuradha 2007).

OTHER ACTIVITIES

Fenugreek has been shown to restore hormonal balance in both women and men. It is particularly helpful for relieving premenstrual syndrome and menopause symptoms, as well as for regulating testosterone production in men (Khorshidian et al., 2016). In experimental models and individuals with hypercholesterolemia, its seeds have been shown to reduce serum cholesterol, triglycerides, and low-density lipoprotein (Basch et al., 2003). Due to the presence of flavonoids and polyphenols, fenugreek shows antioxidant activity. The liver and pancreas benefit from the potent protective properties of fenugreek (Kaviarasan et al., 2004). Breast milk production is induced by fenugreek. Fenugreek leaves have been used as a natural remedy to increase milk production in breastfeeding mothers. This is thought to be due to the presence of compounds that stimulate the production of prolactin, a hormone involved in milk production (Khorshidian et al., 2016; Ravi & Joseph, 2020). According to a theory, fenugreek causes sweat to be produced, which could influence breast milk secretion because the breast is a modified sweat gland. Anecdotal information based on the use of widely available fenugreek as a supplement by about 1,200 women over 6 years. Three times per day, they would take 2 to 3 capsules (580 or 610 milligrams). Most women, it was claimed, noticed a rise in milk production 24 to 72 hours after using the product (Achary et al., 2008). Moreover, Its leaves contain compounds that may help reduce inflammation throughout the body, which could potentially have benefits for conditions such as arthritis (Raju & Bird, 2006). Similarly, it may have beneficial effects on respiratory health, including reducing symptoms of asthma and bronchitis (Srinivasan, 2006).

FORMULATIONS AND ADMINISTRATION

Its leaves are commonly used in Indian and Middle Eastern cuisines. They can be added to curries, soups, stews, and salads to enhance flavor and nutrition. The leaves are particularly abundant in choline. Seeds have antibacterial, bitter, fragrant, and carminative qualities (Srinivasan, 2006). Fenugreek leaves can also be used in herbal preparations, such as teas, extracts, and supplements, for their potential therapeutic benefits. These preparations offer alternative ways to harness the properties of fenugreek leaves.

SAFETY CONSIDERATIONS AND POTENTIAL INTERACTIONS

While fenugreek leaves have numerous health benefits, it's important to consider safety factors. They can cause gastrointestinal upset, allergic reactions, and hypoglycemia in some individuals. Additionally, they may interact with certain medications (Sharma & Choudhary 2014). The leaves may cause gastrointestinal upset in some people, including nausea, diarrhea, and bloating (Geil & Shane-McWhorter 2008). Likewise, some people may be allergic to fenugreek leaves and experience symptoms such as itching, swelling, and difficulty breathing (Ulbricht et al., 2008). Moreover, it may lower blood sugar levels, which can be dangerous for people with diabetes or hypoglycemia if taken in excessive amounts (Yilmaz et al., 2017). It may interact with certain medications, including blood-thinning medications and medications for diabetes. It's important to consult with a healthcare professional before using fenugreek leaves if you are taking medication (Smith & Clinard 2014). Finally, consuming large amounts of fenugreek leaves may cause a distinctive, maple syrup-like odor to emanate from the skin and urine (Bahmani et al., 2016).

REFERENCES

Acharya SN, JE Thomas & SK Basu, 2008. Fenugreek (*Trigonella foenum-graecum* L.) an alternative crop for semiarid regions of North America. Journal of Crop Science 48:84153.

Al-Jasass FM & M S Al Jasser, 2012. Chemical composition and fatty acid content of some spices and herbs under Saudi Arabia conditions. Science World Journal 2012:1-5.

Bahmani M, H Shirzad, M Mirhosseini, A Mesripour & M Rafieian-Kopaei, 2016. A review on ethnobotanical and therapeutic uses of fenugreek (*Trigonella foenum-graceum* L). Journal of Evidence-Based Complementary and Alternative Medicine 21:53–62.

Basch E, C Ulbricht, G Kuo, P Szapary & M Smith, 2003. Therapeutic applications of fenugreek. Alternative Medical Review 8:20-27.

Bhatt DL, M Szarek, PG Steg, CP Cannon, LA Leiter, DK McGuire & B Pitt. 2021. Sotagliflozin in patients with diabetes and recent worsening heart failure. New England Journal of Medicine 384:117-128.

Dixit P, S Ghaskadbi, H Mohan & TPA Devasagayam, 2015. Antioxidant properties of germinated fenugreek seeds. Phytother Research 19: 977-983.

Geil P & L Shane-McWhorter, 2008. Dietary supplements in the management of diabetes: potential risks and benefits. Journal of the American Dietetic Association108:59–65.

Hannan J, L Ali, B Rokeya, J Khaleque, M Akhter & P Flatt, 2007. Soluble dietary fibre fraction of Trigonella foenumgraecum (fenugreek) seed improves glucose homeostasis in animal models of type 1 and type 2 diabetes by delaying carbohydrate digestion and absorption and enhancing insulin action. British Journal of Nutrition 97:51421.

Işıklı ND & E Karababa, 2005. Rheological characterization of fenugreek paste (çemen). Journal of Food Engineering 69:185190.

Kaviarasan S & C Anuradha, 2007. Fenugreek (*Trigonella foenum graecum*) seed polyphenols protect liver from alcohol toxicity: a role on hepatic detoxification system and apoptosis. Pharmazie 62:299-304.

Kaviarasan S, K Vijayalakshmi & C Anuradha, 2004. Polyphenol-rich extract of fenugreek seeds protect erythrocytes from oxidative damage. Plant Foods for Human Nutrition 59:143-7.

Khorshidian N, YA Mojtaba, A Masoumeh, AA Mirzaie & MM Amir, 2016. Fenugreek: potential applications as a functional food and nutraceutical. Nutrition and Food Sciences Research 3:5-16.

Leela NK & KM Shafeekh, 2008. Fenugreek, in chemistry of spices. Ed. by Parthasarathy VA, Chempakam B & Zachariah TJ. CAB International, Wallingford, UK, 242-259.

Meghwal M & TK Goswami, 2012. A Review on the Functional Properties, Nutritional Content, Medicinal Utilization and Potential Application of Fenugreek. Journal of Food Process Technology 3: 1-22.

Mehrafarin A, A Qaderi, S Rezazadeh, H Naghdi-Badi, G Noormohammadi & E Zand, 2010. Bioengineering of Important Secondary Metabolites and Metabolic Pathways in Fenugreek (*Trigonella foenum-graecum* L.). Journal of Medicinal Plants 9: 1-18.

Naika MB, N Sathyanarayanan, RS Sajeevan, T Bhattacharyya, P Ghosh, M Iyer, J Mahita, A Joshi, H Krishnan, KM Shafi, NV Kalmankar, SD Karpe, B Mam, SN Pasha & R Sowdhamini, 2022. Exploring the medicinally important secondary metabolites landscape through the lens of transcriptome data in fenugreek (*Trigonella foenum graecum* L.). Scientific Reports 12:1-23.

Olaiya CO & KO Soetan, 2014. A review of the health benefits of fenugreek (*Trigonella foenum-graecum* L.): Nutritional, Biochemical and pharmaceutical perspectives. American Journal of Social Sciences and Humanities 4:3-12.

Raju J & R Bird, 2006. Alleviation of hepatic steatosis accompanied by modulation of plasma and liver TNF-α levels by *Trigonella foenum graecum* (fenugreek) seeds in Zucker obese(fa/fa) rats. International Journal of Obesity 30:1298-307.

Ravi R & J Joseph, 2020. Effect of fenugreek on breast milk production and weight gain among Infants in the first week of life. Clinical Epidemiology and Global Health 8:656-660.

Sharma MS & PR Choudhary, 2014. Hypolipidemic effect of fenugreek seeds and its comparison with atorvastatin on experimentally induced hyperlipidemia. Journal of College of Physicians and Surgeons Pakistan 24:539-42.

Smith JD & VB Clinard, 2014. Natural products for the management of type 2 diabetes mellitus and comorbid conditions. Journal of the American Pharmacists Association 54:304–318.

Srinivasan K, 2006. Fenugreek (*Trigonella foenum-graecum*): A review of health beneficial physiological effects. Food Reviews International 22: 203-224.

Syeda BB, IB Muhammad & M Shahabuddin, 2008. Antioxidant activity from the extract of fenugreek seeds. Pakistan Journal of Analytical and Environmental Chemistry 9:78-83.

Toppo FA, A Rachna & AK Pathak, 2009. Pharmacological actions and potential uses of *Trigonella foenum-graecum*: a review. Asian Journal of Pharmaceutical and Clinical Research 2:29-38.

Ulbricht C, E Basch, D Burke, L Cheung, E Ernst, N Giese & W Weissner, 2008. Fenugreek (*Trigonella foenum-graecum* L. Leguminosae): an evidence-based systematic review by the natural standard research collaboration. Journal of herbal pharmacotherapy 7:143-177.

Yilmaz Z, F Piracha, L Anderson & N Mazzola, 2017. Supplements for diabetes mellitus: a review of the literature. Journal of pharmacy practice 30:631-638.