

Fenugreek Seed Use in Diabetes Patients

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Abstract: *The annual plant fenugreek (Trigonella foenum - graecum) is a member of the Leguminosae family. It is a herb used as an alternative medicine and it is most commonly used in spices blend and a flavouring agent in Indian dishes. It has been widely used by Ayurvedic and Chinese medicine to treat many diseases. It is high in fiber and protein content and many researches show that it has antidiabetic and antihyperlipidemic properties.*

Keywords: Trigonella foenum graecum, Hyperglycemia, Pre - diabetes, Serum cholesterol, Anti - hyperlipidemic

1. Constituents of Fenugreek Seeds

The endosperm of the defatted seeds and the fraction of fenugreek that contains the testa (i. e., the part of the fenugreek seed with the unique smell and bitter taste) are believed to be linked to the hypoglycemic effects of fenugreek. Studies using lipid extracts have not been discovered these effects. Fenugreek may reduce fats because it contains saponins that are converted to saponinins in the digestive system.

Fenugreek seeds have a 50% fibre content (with 30% soluble and 20% insoluble), which helps reduce the pace of postprandial glucose absorption. Its hypoglycemic impact might have a secondary mechanism for doing this.1

2. Mechanism of Action

Fenugreek seed contains 4 - hydroxyisoleucine, an amino acid (4 - OH - Ile). By directly stimulating pancreatic beta cells, the dose - and glucose - dependent actions of 4 - OH - Ile increase glucose tolerance in people with type 1 or type 2 diabetes mellitus. Several studies were done on human and rat pancreatic islet cells in order to propose alternate mechanism of action. Fenugreek seeds have hypoglycemic effects in people by decreasing the activities of sucrase and alpha - amylase, two intestinal enzymes involved in carbohydrate metabolism, and promoting the release of glucose - dependent insulin from pancreatic beta cells.2

Clinical Data based on Fenugreek Use in Diabetes

Arpana gaddam et al. (2015) proposed that fenugreek, a dietary supplement, alters glucose homeostasis and may help persons with prediabetes avoid developing diabetes mellitus. Men and women with prediabetes aged 30 - 70 years old participated in a 3 - year randomised, controlled, parallel research to compare the effectiveness of fenugreek (n = 66) and matched controls (n = 74) on their health. The three - year trial involved giving study participants 5 g of fenugreek powder twice daily before meals and tracking the evolution of type 2 diabetes mellitus (T2DM) at baseline and every three months. When compared to controls, the cumulative incidence rate of diabetes in the Fenugreek group had dramatically decreased by the conclusion of the intervention period. Low density lipoprotein cholesterol (LDLc), fasting plasma glucose (FPG), and postprandial plasma glucose

(PPPG) were all significantly lower in the fenugreek group, whereas serum insulin was significantly higher. It was shown that subjects in the Fenugreek group had a 4.2 times lower risk of getting diabetes than controls. In the Fenugreek group, the result of diabetes was positively correlated with serum insulin and negatively correlated with insulin resistance. In participants with prediabetes, dietary supplementation with 10 g of fenugreek per day was linked to a lower incidence of developing diabetes without any negative effects, presumably because it reduced insulin resistance.3

RD Sharma et al. (1996) In a metabolic trial, meals with or without 100 g of defatted fenugreek seed powder were randomly administered to 15 non - insulin dependent diabetic individuals, each for 10 days. Fenugreek was added, and the results of the glucose tolerance test improved while fasting blood glucose levels significantly decreased. Significantly less insulin was produced in reactions. The 24 hour urinary glucose excretion was reduced by 64%, and the serum lipid profile was significantly changed. With the fenugreek diet, serum total cholesterol, LDL and VLDL cholesterol, and triglyceride levels reduced without affecting HDL cholesterol fraction. Fenugreek seeds were added to the meals of diabetic patients, and this caused a decrease in fasting blood sugar, improved insulin sensitivity, and an improvement in glucose tolerance. In the study, blood glucose was decreased significantly from 179 ± 24 to 137 ± 20.2 mg/dL as a result of consuming diet containing fenugreek.4

Kassaiyan N et al. (2009) type 2 diabetes patients were given 10 grams of powdered fenugreek seeds daily for eight weeks, either combined with yoghurt or soaked in hot water. Before and after the study, measurements of weight, FBS, HbA1C, total cholesterol, LDL, and HDL were made, as well as a dietary diary. P.05 was regarded as significant when analysing the variations seen in food records, BMI, and serum variables using the paired - t - test and t - student. The outcomes of 18 patients (11 of whom ingested fenugreek in hot water and 7 of whom consumed it in yoghurt) were examined after the elimination of 6 cases due to medication changes or personal issues. Findings revealed that eating fenugreek seed soaked in hot water considerably reduced FBS, TG, and VLDL - C levels (25%, 30%, and 30.6%, respectively), although there were no significant

changes in test results of BMI, carbohydrate, protein and fat intake.⁵

Madar et al. selected Twenty - one type 2 diabetic patients who had fasted overnight completed two meal tolerance tests over a period of four to seven days, one with and one without the addition of 15 g of ground fenugreek seed. Fenugreek was combined with water and ingested over the course of 15 minutes along with a 500 kcal meal that contained 55% carbohydrates, 15% protein, and 30% fat (the study report did not mention the use of washout periods or blinding techniques). Postprandial blood glucose (PBG) levels were shown to be significantly lower 30, 60, and 120 minutes after fenugreek consumption in 17 of the 21 study participants (p 0.05); however, individual changes in PBG values were not specified in the study. The PBG levels of the other 4 patients remained unchanged, so they were left out of the statistical analyses. No negative effects were observed, and fenugreek had no appreciable impact on insulin, triglyceride, or total cholesterol levels. Fenugreek may lower PBG levels and be helpful in the treatment of patients with type 2 diabetes, the authors found, despite the limited sample size and the exclusion of 4 patients from the statistical analysis.⁶

TC Raghuram et al. Fenugreek seeds (*Trigonella foenum graecum*) have been shown to have hypoglycaemic effects in both people and experimental animals. In diabetic individuals, fenugreek has been demonstrated to lower fasting and postprandial blood glucose levels. It is unclear, nevertheless, whether the increase in glucose tolerance is a result of fenugreek's impact on glucose absorption or metabolism. In a crossover research, 10 non - insulin dependent diabetics were randomly assigned to receive meals with or without 25 g of fenugreek for 15 days each. Fenugreek in the diet significantly decreased the area under the plasma glucose curve (AUC), raised the metabolic clearance rate, and decreased the half - life, according to an intravenous glucose tolerance test (GTT) performed at the conclusion of each research period. It also enhanced the number of insulin receptors on erythrocytes. These findings imply that fenugreek can enhance peripheral glucose consumption, which enhances glucose tolerance. As a result, fenugreek may exert its hypoglycemic impact by interacting with the insulin receptor.⁷

Gupta et al. conducted a double - blind clinical trial in which the efficacy of blood glucose control was noted.²⁵ individuals with type 2 diabetes were split into two groups; one group took 1 g of dry hydro alcoholic fenugreek seed extract daily, and the other used diet and exercise to regulate blood sugar. After two months, blood sugar levels dropped in both groups (in the fenugreek group, from 148.3 to 119.9 mg/dL, and in the diet and sport groups, from 137.5 to 113 mg/dL), but there was no discernible difference between the 2 groups. Researchers came to the conclusion that fenugreek, along with diet and exercise, could help type 2 diabetic people control and lower their blood sugar levels.⁸

RD Sharma et al. Fenugreek seeds and leaves were investigated for their hypoglycemic effects on both healthy and diabetic subjects. Six protocols, A, B, C, D, E, and F, involved the acute administration of whole fenugreek seeds,

defatted fenugreek seeds, gum isolate, degummed fenugreek seeds, cooked fenugreek seeds, and cooked fenugreek leaves to healthy subjects (single dose of 25 g of seeds, 5 g of gum isolate, and 150 g of leaves). Fenugreek seeds stopped the rise in plasma glucose following a dose of glucose or meal. The levels of serum insulin were also changed (P 0.05). Whole seeds (42.4%), gum isolate (37.5%), extracted seeds (36.9%), and fried seeds (35.1%) were the ones that reduced the area under the glucose curve the most. Fenugreek leaves and degummed seeds have minimal impact on blood sugar levels. Diabetic individuals were also given fenugreek seeds for 21 days. These participants showed a considerable improvement in their responses to insulin and plasma glucose. Additionally decreased (P 0.05) were the 24 hour urine glucose production and serum cholesterol levels.⁹

Dosage

Commercially, fenugreek is offered in a variety of dosages including seeds, capsules, tablets, tea bags, liquid extracts, powders, and seeds. In clinical research, the daily dose for diabetic patients ranged from 1 to 100 g.^{4 - 10} The mode of administration also varied, with some trials adding fenugreek to yoghurt, bread, water, or pills.² The results, however, cannot be directly linked to the dose of fenugreek utilized because to numerous other variations in these investigations. Fenugreek dosage should be carefully assessed for effectiveness and safety if it is taken specifically to control diabetes.¹⁰

Adverse Effect

The binding properties of fibre may impact the availability of nutrients, especially minerals, therefore extended and high dietary fibre dosage supplementation must be taken with caution. Increased dietary fibre consumption may have negative side effects. Combining dietary fibre from different sources may lower the actual mass of fibre needed to achieve the necessary metabolic effects and lead to a more appetizing diet.¹¹ Mineral malabsorption, excessive flatulence, diarrhoea, and other previously noted issues will all be reduced. Fenugreek has an insulin - like action and a high fibre content, which could lead to hypoglycemia. Fenugreek consumption has been linked to lower serum potassium levels, lightheadedness, hunger, and more frequent urination in healthy males.¹²

Precautions

When fenugreek seed powder was inhaled, it caused rhinorrhoea, wheezing, and fainting. The patients with chronic asthma, after applying fenugreek paste to their scalp as a dandruff therapy, had head numbness, facial angioedema, and wheezing.¹³ Results from studies done on rats, mice, and rabbits indicate that fenugreek is not advised for use during pregnancy because it may cause testicular toxicity and anti - fertility effects in males linked to oxidative stress and DNA damage, as well as anti - fertility, ant implantation, and abortifacient activity in females linked to the saponin compound of fenugreek. Fenugreek should be avoided by anyone who have a peanut or chickpea allergy because of potential cross - reactivity and persistent asthma.¹⁴ Due to the lack of information on fenugreek's effects in humans, the possibility that it could cause hypoglycemia, and evidence from an animal study that

suggests uterine - stimulating properties, it is not advised to be ingested during pregnancy or lactation.¹⁵

Interaction

Fenugreek aqueous extract was found to decrease potassium levels by roughly 14% in a study involving 20 healthy male volunteers, which theoretically could raise the likelihood of harmful interactions with cardiac glycosides and the danger of hypokalemia and concurrent use of mineral corticoids, diuretics, laxatives, or antiarrhythmics.¹² Whether the anticipated encounter resulted, It was not possible to determine whether boldo, which may prevent the synthesis of thromboxane A₂, or fenugreek, which may contain coumarin derivatives, existed.¹⁶

3. Discussion

Nearly 26 million Americans have diabetes mellitus, which is associated with severe morbidity and mortality.¹⁷ The prevalence, morbidity, and mortality rates of diabetes mellitus are high worldwide. Synthetic medications have restrictions and significant adverse effects, making it challenging to manage type 2 diabetes with them. As a result, there is a great deal of interest in using natural, affordable food - based treatments for type 2 diabetes that are based on medicinal plants. Fenugreek seeds, also known as *Trigonella foenum - graecum*, are one of these herbal plants.

The current studies demonstrate that *Trigonella foenum - graecum* seeds play a major effect in improving newly diagnosed type II diabetic patients or pre - diabetic individuals.

In Arpana gaddam et al.³, RD Sharma et al.,⁴ TC Raghuram et al.⁷ studies showed that With no adverse effects, dietary supplementation with 10 g of fenugreek per day was associated with a lower incidence of diabetes development. This is probably because it decreased insulin resistance, improved insulin sensitivity, and an improvement in glucose tolerance proving fenugreek may exert its hypoglycaemic impact by interacting with the insulin receptor.

Madar et al.⁶ study showed, Fenugreek seed may lower Postprandial Blood Glucose levels and be helpful in the treatment of patients with type 2 diabetes,

Gupta et al.⁸ study showed along with diet and exercise, could help type 2 diabetic people control and lower their blood sugar levels.

4. Conclusion

Fenugreek may help individuals with diabetes mellitus improve their glycemic control, according to the evidence that is currently available. The quality of the evidence is poor, hence additional carefully planned studies utilizing standardized ingredients are required to clarify the benefits of fenugreek.

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