



---

## **POSITIVE EFFECT OF FENUGREEK (TRIGONELLA FOENUM-GRÆCUM) SEEDS ON TYPE 2 DIABETES**

Xalilayeva Surayyo Botir qizi

Master's Student, 2nd Year, Biotechnology Program,

Tashkent Institute of Chemical Technology

(surayyokhalilayeva@gmail.com)

Qarshiyev Tolib Ovlayevich

Associate Professor, Department of Biotechnology,

Tashkent Institute of Chemical Technology

(tolibk\_uz@mail.ru)

---

### **Abstract**

Fenugreek seeds are considered rich sources of various important compounds and similar components. Due to their anti-inflammatory, hepatoprotective, cardioprotective, neuroprotective, immunomodulatory, nephroprotective, and antimicrobial activities, they play an important role in the treatment and management of diseases. Fenugreek seeds are a rich source of antioxidants, which reduce the pathogenesis of diseases through their potential free radical scavenging activity. The number of people suffering from type 2 diabetes is increasing worldwide. The rapid rise in the prevalence of type 2 diabetes among children and young people is particularly alarming. At present, it affects 384 million people globally, and as reiterated by the International Diabetes Federation (IDF), this number is expected to reach 592 million by 2035. There is a need to develop better therapeutic agents for the prevention and treatment of this complex condition, since current medications often cause adverse effects, and diabetes can lead to the onset of related diseases. Naturally derived compounds have the potential to prevent and manage several complex conditions, including type 2 diabetes.

**Keywords:** Fenugreek; hyperglycemia; diabetes mellitus; bioactive compounds.



---

## SHAMBALILA (TRIGONELLA FOENUM-GRAECUM) URUG'INING 2-TOIFA DIABETGA IJOBIY TA'SIRI

Xalilayeva Surayyo Botir qizi  
Toshkent kimyo-texnologiya instituti,  
Biotexnologiya yo'nalishi 2 - bosqich magistranti  
(surayyokhalilayeva@gmail.com)

Qarshiyev Tolib Ovlayevich  
Toshkent kimyo-texnologiya instituti,  
Biotexnologiya kafedrasida dotsenti  
(tolibk\_uz@mail.ru)

### **Anotatsiya:**

Shambalila urug'i turli xil muhim birikmalar va shunga o'xshash komponentlarning boy manbalari hisoblanadi. Yallig'lanishga qarshi, gepatoprotektiv, kardioprotektiv, neyroprotektiv, immunomodulyator, nefroprotektiv va mikroblarga qarshi faolligi tufayli kasalliklarni davolash va davolashda muhim rol o'ynaydi. Shambalila urug'i antioksidantga boy manbai bo'lib, bu potentsial erkin radikallarni tozalash faoliyati orqali kasalliklarning patogenezini faoliyati pasaytiradi. Dunyo bo'ylab 2-toifa diabetga chalinganlar soni ortib bormoqda. Bolalar va yoshlarda 2-toifa diabetning tarqalishi tez sur'atlar bilan o'sib borayotgani tashvishga solmoqda. Hozirgi vaqtda bu dunyo bo'ylab 384 million kishiga ta'sir qiladi va Xalqaro diabet federatsiyasi (IDF) tomonidan takrorlanganidek, bu raqam 2035 yilda 592 millionga yetishi kutilmoqda. Ushbu murakkab holatning oldini olish va davolash uchun yaxshiroq terapevtik vositalarni ishlab chiqish zarur, chunki hozirgi dori - darmonlar ko'pincha nojo'ya ta'sirlarni keltirib chiqaradi va qandli diabet shunga o'xshash kasalliklarning boshlanishiga olib kelishi mumkin. Tabiiy kelib chiqadigan birikmalar 2-toifa diabetni o'z ichiga olgan bir nechta murakkab sharoitlarning oldini olish va boshqarish kuchiga ega.

**Kalit so'zlar:** fenugreek; giperqlikemiya; qandli diabet; bioaktiv birikmalar.



## *Modern American Journal of Biological and Environmental Sciences*

ISSN (E): 3067-7920

Volume 2, Issue 4, April 2026

Website: [usajournals.org](http://usajournals.org)

*This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.*

---

### **Introduction**

Since ancient times, plants have been widely used by people for specific treatments because of their health-promoting properties. Plant supplements such as *Nigella sativa* or fenugreek are also used to increase insulin production by maintaining healthy cells and immunity. Many plants are used in the treatment of type 2 diabetes, but fenugreek seeds are considered more effective. Fenugreek (*Trigonella foenum-graecum*), belonging to the Fabaceae family, is commonly known as “fenugreek” and has been used since ancient times as both a food product and a medicinal plant. Fenugreek is a leguminous plant measuring 30–60 cm in length, with leaves approximately 2–2.5 cm long and flowers about 1–2 cm in size. In different countries, it is known by many other names, such as Greek hay seed and Alholva. Fenugreek seeds help reduce blood glucose levels. Fenugreek contains chemical substances with antidiabetic activity, including fiber, saponins, amino acids, and others. Fibers such as galactomannan help reduce blood sugar by delaying carbohydrate absorption. The seeds contain 4-hydroxyisoleucine, which stimulates insulin secretion in the pancreas and thereby helps reduce glucose absorption.

Diabetes mellitus is a metabolic disorder in which the body is unable to metabolize accumulated glucose, and various factors contribute to the development of type 2 diabetes. Diet, genetics, obesity, and deficiency of the islet cells of Langerhans lead to reduced insulin production, which affects the body’s ability to metabolize accumulated glucose and results in its main symptoms, namely polydipsia, polyuria, hyperglycemia, and glycosuria. This condition has long-term effects that may lead to dysfunction of various organs in the body. At present, 384 million people worldwide suffer from diabetes, and as reiterated by the International Diabetes Federation (IDF), this number is expected to reach 592 million by 2035. Preventing this disease is therefore essential. Fenugreek seeds have been studied to evaluate their effect on blood glucose levels in the body, while also helping to prevent obesity, since obesity may lead to hyperglycemia.

Fenugreek seeds are rich in various bioactive compounds, including the following: water-soluble fibers (galactomannan), which help regulate blood sugar by slowing



## *Modern American Journal of Biological and Environmental Sciences*

ISSN (E): 3067-7920

Volume 2, Issue 4, April 2026

Website: [usajournals.org](http://usajournals.org)

*This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.*

---

carbohydrate absorption; amino acids (4-hydroxyisoleucine, an amino acid that stimulates insulin secretion), which promote insulin release; alkaloids and flavonoids, which have antioxidant and anti-inflammatory effects; and saponins, which regulate fat metabolism and cholesterol levels. One of the main benefits of fenugreek seeds is their ability to lower blood glucose levels. The fibers they contain slow down carbohydrate digestion and prevent sharp rises in blood sugar. Studies have shown that consuming fenugreek may reduce postprandial glucose levels.

Increasing insulin sensitivity is another important effect. The amino acid 4-hydroxyisoleucine present in fenugreek stimulates insulin secretion from the pancreas and enhances the insulin sensitivity of cells. This, in turn, helps ensure more effective breakdown and utilization of blood glucose.

Reduction of inflammation is another important benefit, as diabetes may cause chronic inflammation in the body. The flavonoids and saponins found in fenugreek exert antioxidant effects, protect cells from damage, and reduce inflammatory processes.

Improvement of cholesterol levels is also significant. One of the complications associated with diabetes is an increased risk of cardiovascular disease. Fenugreek seeds support heart health by lowering cholesterol and triglyceride levels. Consumption of fenugreek may reduce the level of LDL (low-density lipoprotein), which is considered atherogenic, and increase the level of HDL (high-density lipoprotein), which has cardioprotective properties.

Improvement of the digestive system is another beneficial effect of fenugreek seeds. They enhance metabolic processes in the intestines, help prevent constipation, and support the intestinal microflora. As a result, they contribute to a more balanced absorption of glucose derived from food in the body.

### **Scientific research findings**

The scientific study was based on the observation of individuals with type 2 diabetes over a period of two months. In the present study, patients in both the treatment and control groups were given advice on dietary modification and



lifestyle changes, while the treatment group additionally received fenugreek seed powder. The participants were monitored over a specified period to assess compliance. The selected patients were divided into two treatment groups. The first group served as the control group; the patients in this group followed a standard dietary regimen and did not receive fenugreek seed powder. This group was established for comparison with the other group. The second group consisted of patients with type 2 diabetes who were selected to receive fenugreek seed powder together with a standard dietary regimen.

A daily intake of 5–10 g of fenugreek seed powder is recommended. The initial dose may be 2–3 g and can then be gradually increased. It may be consumed mixed with water, tea, yogurt, or food.

Preparation of a drink with fenugreek powder: 1 teaspoon of fenugreek seed powder is mixed into 1 glass of hot water. It is infused for 10–15 minutes and consumed 1–2 times a day.

A group of researchers administered 10 g of fenugreek seed powder daily to patients with type 2 diabetes for 8 weeks. The results of the study were as follows:

	Patient type		Patient type	
		Control	Treated	
	Male	female	Male	female
Primary BMI in kg/m <sup>2</sup>	26,34± 1,22	26,23 ± 0,83	25,65 ± 0,75	25,60± 0,83
BMI kg/m <sup>2</sup> after 1 month	25,03 ± 1,24	26,22 ± 0,90	25,14 ± 0,75	25,25± 0,85
BMI kg/m <sup>2</sup> after 2 months	25,58 ± 1,25	25,95 ± 0,99	24,62 ± 0,74	24,71± 0,85

The glycemic index decreased, blood glucose levels were reduced by 15–25%, and HbA1c levels improved, indicating better long-term blood sugar control. In another study, the effect of 4-hydroxyisoleucine on insulin secretion was investigated. The



## *Modern American Journal of Biological and Environmental Sciences*

ISSN (E): 3067-7920

Volume 2, Issue 4, April 2026

Website: usajournals.org

*This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.*

---

researchers found that fenugreek powder increases insulin release, reduces insulin resistance, and helps regulate blood glucose levels.

The molecular mechanisms underlying the role of fenugreek in the prevention and management of type 2 diabetes are gradually being explored. Its antidiabetic effect is mainly associated with its hypoglycemic activity, which lowers blood glucose levels through the influence on various molecules, receptors, and cellular membranes. Fenugreek also reduces oxidative stress and lipoprotein levels, which additionally contribute to its antidiabetic effect. However, further mechanistic studies are required to better understand how fenugreek and its bioactive compounds affect glucose metabolism and insulin sensitivity.

### **Conclusion**

Fenugreek (*Trigonella foenum-graecum*) seeds are rich in biologically active compounds, and their effects on the body are of considerable importance in controlling type 2 diabetes and reducing its complications. The galactomannan fibers, the amino acid 4-hydroxyisoleucine, saponins, and flavonoids present in fenugreek help lower blood glucose levels by regulating carbohydrate metabolism, stimulating insulin secretion, and increasing cellular insulin sensitivity. The most effective measures for managing type 2 diabetes are reducing the consumption of sugary foods and increasing physical activity in order to maintain a normal body weight, since obesity is also one of the main causes of diabetes. Regular consumption of fenugreek seed powder in appropriate amounts has been shown to improve glycemic control, normalize body weight and BMI indicators, and stabilize the overall metabolic condition in patients with type 2 diabetes. Therefore, fenugreek seeds may be used as an effective natural antidiabetic agent in the prevention and комплекс treatment of type 2 diabetes.

### **References**

1. Abramchuk, A. V., & Mingalev, S. K. (2004). Cultivated medicinal plants: Assortment, characteristics, and cultivation technology. Yekaterinburg, 292 p.



***Modern American Journal of Biological and Environmental Sciences***

**ISSN (E):** 3067-7920

Volume 2, Issue 4, April 2026

**Website:** usajournals.org

***This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.***

- 
2. Abramchuk, A. V., & Kartasheva, G. G. (2010). Medicinal plants of the Urals. Yekaterinburg, 552 p.
  3. Abramchuk, A. V., Kartasheva, G. G., Mingalev, K. S., et al. (2014). Medicinal flora of the Urals: A textbook for agronomy specialties at universities. Yekaterinburg, 738 p.
  4. Yaribeygi, H., Maleki, M., & Sathyapalan, T. (2021). Pathophysiology of physical inactivity-related insulin resistance: A theoretical mechanistic review highlighting clinical evidence.
  5. Vadadokhau, U., Varga, I., & Káplár, M. (2024). Investigating the complex molecular landscape in obesity and type 2 diabetes. *International Journal of Molecular Sciences*, 25, 4781.
  6. Barnaulov, O. D. (2015). Medicinal properties of spices. Saint Petersburg: Inform-Navigator, 288 p.
  7. Kyusev, P. A. (2006). Complete handbook of medicinal plants. Moscow: Eksmo Publishing, 992 p.