



FENUGREEK – A REVIEW ON ITS POTENTIALITY ON DIABETES MELLITUS AND UTILIZATION THROUGH VARIED FOOD PRODUCTS

¹Jhansi Vadlamudi, ²Dr K Anuradha

ABSTRACT: Fenugreek (*Trigonella foenum-graecum*) is a legume of family fabaceae. On the grounds of historical instances it is used as an ingredient in spice blends as well as in the treatment of numerous diseases. It possesses hypoglycemic belongings and is used within the treatment of diabetes mellitus because of glucomannan - fibre. Besides its medicinal value it is used within the development of various food merchandise due to its emulsifying and stabilizing properties. For this reason it could be used in the development of wholesome nutritious meals for diabetic patients. The present paper reviews approximately the hypoglycemic impact of fenugreek and its usage in various food product traits.

Index Terms: Fenugreek seeds, hypoglycemia, diabetes mellitus, glucomannan

I. INTRODUCTION

Trigonella foenum-graecum normally called fenugreek is a clover-like herb local to the Mediterranean vicinity, southern Europe, and western Asia. It is an annual plant inside the circle of relatives Fabaceae, its seeds are bitter to taste and are regarded for a long term for their medicinal traits (Genet et al., 2019; Prasanna, 2000; Dangi et al., 2004). It is utilized in cooking as a factor in spice blends and as a flavoring agent in foods and beverages. In a 100 g quantity, fenugreek seeds offer 323 kcal of energy, 9% water, 58% carbohydrates, 23% protein and 6% fats. Fenugreek seeds include 45.4% dietary fiber (32% insoluble and 13.3% soluble) and the gum is composed of galactose and mannose (Sajad Ahmad Wani & Pradyuman Kumar, 2018).

Diabetes-mellitus is a metabolic sickness and swiftly increasing global in both advanced and growing countries characterized by way of persistent hyperglycemia (American Diabetes Association). The WHO estimates an incidence of 347 million people with diabetes and a predicted 4.6 million deaths every year (Genet et al., 2019). The prevalence is anticipated to double in 2030, and the extra percentage of this boom might be in the low to middle income international locations of Asia, Africa, and South America (Kumar K. et al., 2015). The contemporary treatment proceeds towards oral antidiabetic agents and insulin injections. Current medicine assists in the control of blood glucose, but many side effects results. Treating illnesses with the use of herbs has been fairly practiced due to their enormous nutraceutical residences and safety components (Quamar Abbas Syed et al., 2020).

Specifically principal herbs are used within the treatment of diabetes however Fenugreek is located to be one of the eminent spice crop having nutritious, useful, medicinal and nutraceutical properties (Aasim M. et al., 2018) and can be incorporated into foods to produce functional foods (Nasim Khorshidian et al., 2016). This overview discusses the impact of fenugreek seeds on Diabetes Mellitus and use of seeds in numerous food developments.

Fenugreek reach in controlling Diabetes Mellitus

Consumption of 10gms of complete fenugreek seeds powder every day decreased fasting blood glucose, HbA1c and expanded serum adiponectin levels (Maryam Rafrat et al., 2014; Nithya Neelakantan et al., 2014; Jing Gong et al., 2016). Fenugreek seeds soaked in water taken 30min before a meal along with routine antidiabetic remedy was located to be effective in decreasing fasting blood glucose. This transformation became glaring after 2 months of supplementation and a superb difference turned into determined simplest after 5 months of supplementation (Manjiri Ranade and Nikhil Mudgalkar, 2017). Impact of fenugreek on diabetes turned into study in 60 diabetic patients for two months.

The patients were randomized into groups. One group obtained fenugreek powder of 10gms before breakfast and 10gms before dinner for a length of two months. Blood samples have been gathered at base line, after one month and at the end. Consumption of fenugreek powder correctly decreased fasting blood glucose, random blood glucose and HbA1c in comparison to control (Muhammad Haseeb ur Rehmani et al., 2021). In another look adjunct use of fenugreek seeds stepped forward glycemic control and reduced insulin resistance in mild type-2 diabetic sufferers when 1gm/day hydroalcoholic extract of fenugreek is given (Gupta et al., 2001). An experiment was carried out to analyze the postprandial hypoglycemic effect of fenugreek seeds on patients with type-2 diabetes. Pretest - posttest control study was used in the examine. A hundred and sixty six type-2 diabetic sufferers had been assigned into three groups, FG0 (control group: placebo drink), FG2.5 (2.5g of fenugreek), and FG5 (5g of fenugreek). Members have been informed to drink the extract and chunk the seeds. Postprandial plasma glucose level was measured earlier than and a couple of-hours after the management of the remedy. Accounting for gender, age, schooling, bodily activity, body mass index, glycemic control, and medicine, patients in FG5group confirmed the finest lower in postprandial glucose with a pretest-posttest distinction. Two hour plasma glucose dropped for patients in FG2.5 group, but, the drop was no longer statistically specific from that observed inside the placebo group (Hiba A. Bawadi et al., 2009). To understand the effectiveness of fenugreek in type 2 diabetes, elderly sufferers between 35-65 years have been given 25gms powder every day 15minutes earlier to lunch and dinner for three weeks along with popular conventional remedy and the alternative was given traditional remedy. Fenugreek supplemented group confirmed a big improvement in fasting and postprandial blood glucose (Anasuya and Venkateswara Rao, 2018). Impact of fenugreek included food on blood sugar levels of 24 NIDDM patients was investigated in a study. Therapeutic food was developed from legumes viz., Bengal gram (100 gm), green gram (50g), horse gram (50g), dry peas (50g) and fenugreek seeds (50g). An amount of 30g of product was supplemented to the subjects for a length of 1 month. Both fasting and postprandial blood sugar levels had been reduced appreciably after the administration of food. Those effects imply the usefulness of excessive fiber in fenugreek in the management of diabetes (Samita Kumari and Mukul Sinha, 2005).

Hypoglycemic effect of fenugreek seeds was seen in type I diabetic patients too. Incorporating defatted fenugreek seed powder of 100g daily into the diet reduced fasting blood sugar and improved glucose tolerance in type 1 diabetes sufferers (Sharma et al., 1990).

In streptozotocin induced diabetic rats, lower blood glucose and glycated hemoglobin was observed whilst oral intragastric intubation of fenugreek extract was given. The diabetic rats had been administered with low dose (0.44g/kg/d) middle dose (0.87g/kg/day) and high dose (1.74g/kg/day) of fenugreek extract and metformin Hcl for 6 weeks (Wan-Li Xue et al., 2007). In every other streptozotocin-triggered diabetic rats fenugreek seed extract of 100mg/kg both given oral or intraperitoneal each day or every other day for 4 weeks drastically reduced blood glucose (Marine E Baset et al., 202). Seed extract of fenugreek had both anti-glycation and glycation reversing activity and is proven in BSA -glucose glycation model (Abeysekera et al., 2018). Use of fenugreek would delay the onset of diabetes in prediabetics with the enhancement of serum insulin levels due to insulinotropic impact of alkaloids in them (Jing Gong et al., 2016; Aparna Gaddam et al., 2015). In a study elderly women and men between 30-70 years having fasting plasma glucose 100-125mg/dl or oral glucose tolerance 140-199mg/dl have been taken. They have been divided into control and experimental and are observed up for three years. The principle cause for reduced blood glucose in type I and II diabetics is due to soluble fibres in fenugreek specifically glucomannan fibre which delays the intestinal absorption of ingested sugars. Alkaloids inclusive of fenugrecin and trigonelline have hypoglycemic action, and 4 hydroxy isoleucine aminoacid, acts on pancreas to release insulin (Manjiri Ranade and Nikhil Mudgalkar, 2017; David Koupy et al., 2015). Fenugreek seeds soaked in water turned into use as an adjuvant in the management of type 2 diabetes mellitus. A Dose of 10gm discovered to be tolerable and powerful in maximum of the studies (Manjiri Ranade and Nikhil Mudgalkar, 2017; Mehedee Hasan and Mustafizur Rahman, 2016).

Fenugreek seed powder had hanging impact on enhancing lipid metabolism in type II diabetic sufferers and produced a widespread reduction in total cholesterol, triglycerides, low density lipoprotein and increase in high density lipo protein level (Genet et al., 2019). Effectiveness of fenugreek seeds was estimated for blood lipid in streptozotocin induced diabetic rats when administered by using oral intragastric intubation of low dose, middle dose and high dose of fenugreek extract and metformin Hcl for about 6 weeks. In comparison to diabetic rats, rats handled with fenugreek extract had lower triglycerides, total LDL cholesterol and higher high density - lipoprotein - HDL cholesterol in a dose established way manner (Wan-Li Xue et al., 2007).

Use of fenugreek seeds in the development of various foods

Fenugreek is being widely used in food industry. The dietary fiber in fenugreek has glucomannan composition which has emulsifying and stabilizing properties. Glucomannan has a property of increasing viscosity when dissolved in water. Flour supplemented with 8%–10% fenugreek dietary fiber has been used in the production of baked goods which include bread, pizza, muffins, and cakes (Keisha T Roberts, 2011; Deeptanshu Srivastava et al., 2012). Fenugreek supplemented at 5,10 and15% levels in wheat flour for the production of bread and biscuit to improve dietary profile was studied. The nutritive values in terms of protein, fiber, ash as well as calcium, magnesium, iron and zinc content of bread and biscuit increased because of the supplementation of germinated fenugreek flour to wheat flour. The sensory assessment of the bread samples made by using supplementation at 5 and 10% and five percent levels for biscuit have been rated ideal (Kasaye & Jha, 2015). In an observe wheat flour was substituted with fenugreek flour (uncooked, soaked and germinated) at 5–20% levels for product making. Nutrient evaluation of the blends, product improvement and their acceptability had been carried out. An alternative use of fenugreek flour in place of wheat flour enhanced the protein, fat, lysine, minerals, and dietary fibre contents proportionately to the level of

substitution. Amidst composite flours, the blends containing germinated fenugreek flour had been discovered superior in nutrient level as compared to others. Bread, biscuits, noodles, and macaroni prepared from the wheat–fenugreek blends at all levels, have been observed organoleptically appropriate (Hooda & Jood, 2004). One more study with same level of substitution with raw, soaked and germinated fenugreek seed flour showed increase in thickness and decrease in width and spread ratio with increase in fenugreek flour. The sensory effects confirmed that 10% fenugreek flour can be incorporated to prepare perfect exceptional biscuits. The protein, lysine, fibre, calcium and iron content was found to be elevated at 10% level of substitution. Biscuits can be stored in polypropylene bags upto 1 month without altering the organoleptic properties (Hooda & Jood, 2005). In an attempt to examine the effect of fortification of biscuits with 10%, 20% and 30% of fenugreek seed that germinated for two to five days, germinated fenugreek flour for two and three days at a level of ten percent was desirable to get biscuits of great quality (Al-Gemeai, 2016). Fenugreek was added to chapati in two different ways. It was discovered that replacement of 7.5% wheat flour with fenugreek powder and substitute of water used to prepare dough with 10% fenugreek extract had same acceptability as that of normal. The nutrient analysis of these confirmed that protein content enhanced and carbohydrate decreased where as fiber content increased with addition of fenugreek powder but remained unchanged with addition of fenugreek extract (Gartoula Usha, 2001). In a study to evaluate the functional properties of wheat flour rusks prepared by adding debittered fenugreek flour at a level of 5, 10, 15 and 20 percent the flavonoid, phenolic and antioxidant activity increased with increase in mineral and dietary fiber (Sanju BalaDhull et al., 2019). Sensory assessment of bread made with fenugreek and dark wheat flour (kind 1250) was executed in a study. The fenugreek flour mixed with wheat flour at two and five percent had acceptable scores (Simona Maria Man et al., 2019). Incorporating fenugreek into traditional food products like cheela, dal, sabji and pickle was studied. All the food products were found to be acceptable (Rawat et al., 2016).

CONCLUSION

Fenugreek's hypoglycemic impact has been particularly documented in people and animals with type 1 and type 2 diabetes mellitus (Keisha T Roberts, 2011). Due to unwanted side effects of oral anti-diabetic tablets, there may be a sturdy desire to use herbs in the remedy of diabetes. Globally, researchers had been looking for herbal healing substances that can be used to deal with or delay the onset of lifestyle-associated issues. As a result fenugreek can be an exceptional desire inside the remedy of diabetes mellitus due to the fact it may be supplemented in normally consumed recipes. Fenugreek complement up to 10gms was found to be powerful and tolerable in the remedy of diabetes mellitus and foodstuffs made at 10% level of substitution have been also discovered to be acceptable from the assessment.

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