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A SHORT REVIEW ON FENUGREEK -A PLANT OF MULTIPLE USES

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ABSTRACT

A large number of different varieties of plants have been used for medicinal purposes throughout the world since centuries. In Ayurveda, fenugreek (Trigonella foenum-graecum) was reported to be one of the most potent medicinal plants. Historical uses of fenugreek were recorded as abortifacient, appetite stimulant, baldness, boils, breast enhancement, bronchitis, cellulites, constipation, cough, diarrhoea, eczema, flatulence, galactagogue, hepatitis disease, hernia, indigestion, leg ulcers, menopausal symptoms, myalgia, postmenopausal vaginal dryness, hyperglycaemia, tuberculosis and wound healing. This plant has also the properties for decreasing blood lipids and sugar in diabetic and non-diabetic people and it also exhibits antioxidant and antibacterial activity. This plant is known to decrease body fats and found to be effective on obesity. Fenugreek contains oils, alkaloids, amino acids (lysine, arginine, tryptophan, threonine, vinyl and methionine) and contains vitamins A, C, D, B1 and minerals calcium, iron and zinc. In addition to its medicinal and nutritional properties, fenugreek is found to be responsible for so certain side effects.

Key words: fenugreek, therapeutic use, antioxidant activity, antibacterial activity

INTRODUCTION

Historical and theoretical uses abound and the list is long, but a sampling includes: abortifacient, appetite stimulant, baldness, boils, breast enhancement, bronchitis, cellulites, constipation, cough, diarrhoea, eczema, flatulence, galactagogue, hepatitis disease, hernia, indigestion, leg ulcers, menopausal symptoms, myalgia, postmenopausal vaginal dryness, hyperglycaemia, tuberculosis and wound healing[1].

In the 1800s, fenugreek was used in the U.S. as part of an infamous Lydia Pinkham formula called “Vegetable Compound”--- for menstrual cramps and for postmenopausal vaginal dryness. It also has a food based tradition, used to supplement wheat and maize flour for making bread, and as a condiment [1].

Plants are used medicinally in different countries and are a source of many potent and powerful drugs. Natural products have been a major source of new drugs [2]. Medicinal plants are used by 80% of the world population as the only available medicines especially in developing countries [3]. Fenugreek is one of the oldest medicinal plants, originating in India and Northern Africa. An annual plant, fenugreek grows to an average height of two feet [4]. This plant is used for decreasing blood lipids and sugar in diabetic and non-diabetic people and exhibits antioxidant and antibacterial activity. This plant decreases body fats and effective on obesity. This plant use in therapy atherosclerosis [5], rheumatism [6], sugar lowering [7], blood lipids lowering [8], appetizer [9] and contain antioxidant activity [10].

The leaves and seeds, which mature in long pods, are used to prepare extracts or powders for medicinal use. Applications of fenugreek were documented in ancient Egypt where it was used in incense and to embalm mummies. In modern Egypt, fenugreek is still used as a supplement in wheat and maize flour for bread-making. In ancient Rome, fenugreek was purportedly used to aid labor and delivery. In traditional Chinese medicine, fenugreek seeds are used as a tonic as well as a treatment for weakness, edema of the legs, abdominal pains, hernia and “cold-damp”

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conditions. In India, fenugreek is commonly consumed as a condiment and used medicinally as a lactation stimulant. There are numerous other folkloric uses of fenugreek, including the treatment of indigestion and baldness. The possible hypoglycaemic and antihyperlipidemic properties of oral fenugreek seed powder have been suggested by the results of preliminary animal and human trials [11].

HABITAT AND CULTIVATION

Trigonella foenum-graecum (fenugeek) is 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[12].

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 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 cultivars high in sapogenins [13].

Table 1: Proximate Composition (%) of Fenugreek Seeds [15]

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 Fibre	48.0	51.7
Gum	20.0	19.2
Neutral Detergent fibre	28.0	32.5

ACTIVE CONSTITUENTS

Fenugreek contains saponins that are transformed in the gastrointestinal tract into sapogenins. Other saponins present in this plant are sarsapogenin, yuccagenin, smilagenin and the most important one being diosgenin [14]. Fenugreek seeds contain 50-percent fibre (30 per-cent soluble fibre and 20-percent insoluble fibre) that can slow down the rate of postprandial glucose absorption [4]. Fenugreek seeds contain oils, alkaloids, amino acids (lysine, argenine, tryptophan, threonine, valyn and methionine) and mucilage. The plant also contains vitamins A, C, D, B1 and, minerals calcium, iron and zinc [14].

Proximate analysis of seed is shown in table no 1.

- **Antioxidant activity of fenugreek:**

Antioxidants decrease cardiac disease [16], and increase immunity [17]. Spices and herbs possess antioxidant activity and can be applied for preservation of lipid peroxidation in biological systems. Fenugreek (Trigonella foenum-graecum) is an important spice; its dried seeds have wide application in food and beverages as a flavouring additive as well as in medicines[10].The antioxidant property of the plant material is due to the presence of many active phytochemicals including vitamins, flavonoids, terpenoids, carotenoids, coumarins, curcumins, lignin, saponin, plant, sterolandetc[10]. Free radicals are implicated for more than 80 diseases including diabetes mellitus, atherosclerosis, cataract, rheumatism, and other auto immune disease like aging, etc. Antioxidant therapy has gained utmost importance the treatment of these diseases. Current research is now directed towards finding naturally occurring antioxidant of plant origin. In Indian system of medicine *Trigonella foenum-graecum* is an important medicinal plant. Antioxidants exert their mode of action by suppression of formation of the reactive oxygen either by inhibition of enzymes or by chelating trace elements [16]. Antioxidant benefits of fenugreek is related with existence of phenol and saponins, and therefore used in liver therapy [17].

- **Antibacterial activity of fenugreek :**

Screening of medicinal plants for antimicrobial activities is important for finding potential of new compounds for therapeutic use. Fenugreek also exhibit antibacterial activity[18, 19]. The use of synthetic α-glucosidase inhibitors such as acarbose, cause adverse side effects such as abdominal distention due to the excessive inhibition of pancreatic enzymes, resulting in the

abnormal bacterial fermentation of undigested carbohydrates in the colon. Hence, research on the development and utilization of anti-diabetic plants with mild inhibition of pancreatic enzymes is beneficial [19, 20]. The mechanism of inhibition of the glycolytic activity of α-amylase may occur through the direct blockage of the active centre at several sub sites of the enzyme as also suggested for other inhibitors [21]. The α-amylase inhibitory factors present in the fenugreek extract probably interact with the active sites of the enzyme in a substrate specific manner. Fenugreek is effective in inhibiting the growth of *Pseudomonas spp.*, *E. coli*, *Shigella dysentiriae*, and *Salmonella typhi* [22].

THERAPEUTIC USES

Fenugreek has been used in various ayurvedic preparations to treat various ailments. They are,

1. Sugar decreasing and diabetes:

Fenugreek seed powder in the diet reduces blood sugar and urine sugar with concomitant improvement in glucose tolerance and diabetic symptoms in type 2 diabetic patients [23]. The studies [24, 25, 26], showed hypoglycaemic effect of fenugreek seeds in type 2 diabetics[27]. The hypoglycaemic effects of fenugreek have been attributed to several mechanisms. It was demonstrated in *in vitro* studies that the amino acid 4 -hydroxyisolcucine in fenugreek seeds increased glucose-induced insulin release in human and rat pancreatic islet cells. It was also observed that 4-hydroxyisoleucine extracted from fenugreek seeds has insulin tropic activity [28]. It shows that amino acid appeared to act only on pancreatic beta cells, since the levels of somatostatin and glucagon were not altered. In human studies, fenugreek reduced the area under the plasma glucose curve and increased the number of insulin receptors, although the mechanism for this effect is unclear[29]. In humans, fenugreek seeds exert hypoglycaemic effects by stimulating glucose-dependent insulin secretion from pancreatic beta cells[30], as well as by inhibiting the activities of alpha-amylase and 50ignali, two intestinal enzymes involved in carbohydrate metabolism. According report [31] the hypoglycaemic effect of fenugreek is thought to be largely due to its high content of soluble fibre, which acts to decrease the rate of gastric emptying thereby delaying the absorption of glucose from the small intestine. The cases suggest fenugreek reduced post-prandial hyperglycaemia primarily in subjects with diabetes, but less so in subjects without diabetes. This effect might be more pronounced if raw seeds rather than boiled seeds had been used. Fenugreek may aid with insulin secretion, as suggested by animal studies, since typically these patients have little or no endogenous insulin production [4]. Animal tests have proved that galactomannan blocks intestinal absorption of glucose. Water soluble fibre increases the viscosity inside the intestine and then inhibits absorption of glucose.

2. Decreasing Blood lipids:

According to report [32, 8], supplementation of these medicinal plants mixture (fenugreek), decreased in serum triglycerides, total cholesterol, LDL-C, VLDL-C in both raw and cooked form but increased in HDL-C with the increase in supplementation of medicinal plants. Studies reported that diabetic state, resulting from an impaired secretion and sensitivity of insulin may be responsible for high triglycerides level in serum than normal individuals, as the insulin stimulated the synthesis of adipose tissue by agency of lipoprotein lipase [33]. Similar decrease in triglycerides and total cholesterol level of the diabetics were observed by feeding fenugreek seeds by various workers [26]. Because fenugreek is containing fibre and fiber have effect of dietary fiber on lipoprotein cholesterol is due to its association with absorption and transport of lipids [34]. Too, according reports, Fenugreek seeds also lower serum triglycerides, total cholesterol (TC), and low-density lipoprotein cholesterol (LDL-C) [35, 36]. These effects may be due to sapogenins, which increase biliary cholesterol excretion, in turn leading to lowered serum cholesterol levels. The lipid-lowering effect of fenugreek might also be attributed to its estrogenic constituent, indirectly increasing thyroid hormone [37]. The quality and quantity of protein in the diets have a direct effect on the levels of cholesterol. Generally plant protein appears to lower cholesterol level [38]. The plant protein in fenugreek is 26%, so it might exert a lipid lowering effect [39]. A study on the extent of degradation of the saponin and/or diosgenin another steroid saponins in the alimentary tract of alloxan diabetic dogs suggested that steroid saponinand sapogenin might have a role in lowering cholesterol [40]. The lipid-lowering potential of diosgenin has been demonstrated by several experimental studies [41]. Diosgenin decreased the elevated cholesterol in serum LDL and HDL fractions in cholesterol-fed rats, and had no effect on serum cholesterol in normo cholesterolemic rats. In addition, diosgenin inhibited cholesterol absorption and suppressed its uptake in serum and liver and its accumulation in the liver [42].

3. Increases Breast Milk:

Fenugreek is used as a galactagogue by nursing mothers to increase inadequate breast milk supply. This is evidenced by a study which found that consumption of herbal tea containing fenugreek seeds enhanced breast milk production in mothers and facilitated infant birth weight regain in early postnatal days[43].

4. Reduces Cholesterol:

Fenugreek contains saponins that help reduce the body's absorption of cholesterol from fatty foods. Some studies also indicate saponins to have a role to play in reducing the body's production of cholesterol, especially the LDL levels[44].

5. Protects from Cancer:

Studies have shown that the fibres in fenugreek help prevent certain cancers. Fenugreek has estrogenic effects and could be a possible alternative to hormone replacement therapy (HRT). Other studies have shown that saponins and mucilage in fenugreek bind to toxins in the food and flush them out, thus protecting the mucus membrane of the colon from cancers[44].

6. Maintains healthy Testosterone Levels:

An Australian study reported significant positive effect of fenugreek on physiological aspects of male libido and also found that it may assist to maintain normal healthy testosterone levels[44].

7. Aids Digestion:

Fenugreek is said to be an effective heartburn or acid reflux remedy because the mucilage in fenugreek seeds assists in soothing gastrointestinal inflammation and coating the stomach and intestinal lining[44].

8. Helps with Weight Loss:

Fenugreek complements diet and exercise for weight loss. This thermo genic herb aids weight loss by suppressing appetite, increasing energy in the short term, and potentially modulating carbohydrate metabolism[44].

SIDE EFFECTS OF FENUGREEK

In large doses, fenugreek may cause birth-defects because of its teratogenic potential. It would be prudent to avoid fenugreek supplementation during pregnancy as it can cause internal bleeding, skin irritation and allergy. Severe allergy symptoms include chest pain, facial swelling, and difficulty in breathing or swallowing. Diarrhoea, indigestion, heartburn, gas, bloating and urine odor are other possible side effects of fenugreek[44].

CONCLUSION

Fenugreek has been a regular part of human diet, mainly as fresh leafy vegetable in many Asian and African countries. It is mainly due to its antibacterial activity, antioxidant activity and nutritional properties. The seeds also show many medicinal properties for many disorders. However, there are some reports showing negatives side effects when consumed in excess.

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