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Methi (Trigonella Foenum-Graecum): A Multifunctional Herbal Drug

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ABSTRACT

Herbal medicines are one kind of dietary supplement, and they are used for their scent, flavor, or therapeutic properties. Methi or Trigonella foenum-graecum (TFG) belonging to the family Fabaceae is an aromatic perennial herb which is cultivated throughout India. It is widely used in cosmetic and flavoring industries. It is included in the formulations used for cholasma, improving complexion and beautification. According to Unani classical literature, its suppository was made in conjunction with duck fat and introduced into the body to cure scirrhus of the uterus and its mouth opened up. It is extensively used for several human diseases mentioned in Unani system of medicine. Various scientific/ experimental studies have been performed presently on TFG namely, phytochemical, physicochemical, pharmacological and clinical studies. In this review, Various actions and clinical indications have been elaborated in the Unani classical literature and some properties namely Anti-inflammatory, An-diabetic, Antiarthritic, Antiglycemic, Antioxidant and Anti-stress activities have been revalidated in the light of recent scientific researches. Significant information about methi as a traditional herbal medicine is provided in this review.

Keywords: Methi, Hulba, Trigonella foenum-graecum, Unani System of medicine, Herbal drug.

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INTRODUCTION

The medicinal plants are used therapeutically all over the world for curing various diseases, and it is one of the oldest and the safest methods to cure illness. *Methi* is used as an herb (dried or fresh leaves), spice (seeds), and vegetable (fresh leaves, sprouts, and microgreens).

Methi (*Trigonella foenum-graecum*) is a common condiment and aromatic herb, cultivated throughout India. In India, it is introduced by the Unani physicians. It is commonly used medicinally as a galactagogue to increase adequate breast milk supply. In Unani system of medicine, *Hulba* or Methi is an important medicinal plant, and its leaves and seeds have been used in various ailments and also as a health tonic. Sotolon is the chemical responsible for fenugreek's distinctive sweet smell [1, 2].

Methi is orally used for diabetes, constipation, loss of appetite, gastroesophageal reflux disease (GERD), gastritis, dysmenorrhea, , obesity, atherosclerosis, polycystic ovary syndrome, hyperlipidemia, and for stimulating lactation, dyspepsia, kidney diseases, beriberi, fever, mouth ulcers, boils, bronchitis, cellulitis, tuberculosis, chronic coughs, chapped lips, baldness, Parkinson's disease, exercise performance, and cancer. It is topically used as a poultice for local inflammation, myalgia, lymphadenitis, gout, wounds, leg ulcers, and eczema [3, 4].

It is a well-known ingredient of spice blends which prevents ageing, imparts immunity, improves mental function, labour pain and adds vitality to the body. It is a part and parcel of Indian traditional knowledge (TK) system. It has immense importance of its traditional knowledge, which is evident from the TK database. More than 50 patents have been granted till date [5-7].

ETHNO-PHARMACOLOGICAL DESCRIPTION

Methi is a famous drug. Its plant is about 1 meter long; branches are thin; leaves are small and round. It is a famous vegetable also, which is cultivated. Its leaves are cooked as *saag*. Flowers are yellow in color. Seeds are mucilaginous, small, flat and yellowish in color. Its taste is bitter and odor is in high note [8-10].

In "*Zakhira Khwarzam Shahi"*, Jurjani mentioned that *Hulba* or methi is effective in female diseases, especially in *waram-e-rahem* and *quruh-e-rahem* [11].

Al Biruni described it as methi in detail in his celebrated book titled *"Kitab al Saidnah fil al Tib*". According to Al Biruni, Jalinoos mentioned it as *Tilis*. It has many names. Its bran, when cooked after admixture with *maliqaratin* and applied to the body acts as an aperient. Its bran is also useful for hot inflammations which appear now and then outside and inside the body. Its bran given in conjunction with *natron* (salt) resolves the inflammation of the spleen. Women sit in its decoction, and wash their hair in its expressed oil. Its suppository was made in conjunction with duck fat and introduced into the body to cure scirrhus of the uterus and its mouth opened up [12].

The parts used medicinally are mainly seeds [2, 7, 10, 12-19] and leaves [1,2,7,18,19]. According to Unani classical literature, the *Mizaj* (temperament) of this plant Hot and Dry [1, 12, 16, 20]. But Hot in second degree and Dry described by some scholars [8, 9, 14, 15, 21,]. The dose of seeds is 3-5 grams [1, 9, 15, 17, 22].

MORPHOLOGICAL DESCRIPTION

The plant is a slightly hairy, nearly smooth and aromatic annual plant. Leaves are long stalked up to 5 cm long, stipules triangular, lanceolate. Leaflets are 2.5 cm long, obovote to oblanceolate and toothed. Flowers are whitish or lemon yellow in color, 1-2 axillary sessile. Seeds are greenish-brown, oblong, flattened or irregularly flattened or irregularly rhomboidal, 3 to 5 mm long, 2 to 3 mm wide about 2mm thick, hard, heavy pebble-like, with a deep groove

across one corner giving the seeds a hooked appearance [1,25].

The methi plant is found wild in Punjab,Kashmir, Upper Gangetic Plains and widely cultivated in many parts of India namely Kashmir, Punjab, Uttar Pradesh, Madhya Pradesh, Assam, Maharashtra and Tamilnadu [7,16,22,19].

MICROSCOPIC DESCRIPTION

Seed shows a layer of thick-walled, columnar palisade, covered externally with thick cuticle; cells flat at base, mostly pointed but a few flattened at apex, supported internally by a tangentially wide bearer cells having radiameter l rib-like thickenings; followed by 4-5 layers of tangentially elongated, thin-walled, parenchymatous cells. Endosperm consists of a layer of thick-walled cells containing aleurone grains, several layers of thin-walled, mucilaginous cells, varying in size, long axis radially elongated in outer region and tangentially elongated in inner region. The cotyledons consists of 3- 4 layers of palisade cells varying in size with long axis and a few layers of rudimentary 6 spongy tissue; rudimentary vascular tissue situated in spongy mensophyll; cells of cotyledon contain aleurone grains and oil globules [1].

ACTIONS AND THERAPEUTIC USES OF METHI

Various kinds of actions and clinical indications of methi are given below:

Jali (Detergent)[1,8,9,10,14], *Kasir-e-Riyah* (Carminative)[1,8,15-19], *Muhallil* (Resolvent)[1,8-10,15,20,24], *Muhallil-e-Waram* (Anti-inflammatory)[8,9,14,17,20], *Mudir-e-Baul* (Diuretic))[1,8,15-19], *Mubarrid* (Cooling/Refrigerant) [16], *Mudir-e-Haiz* (Emmenagogue))[1,8,15-19], *Mudir-e-Laban* (Galactagogue)[2,18,22], *Mugharri* (Emollient)[2,19], *Mulayyin*(Laxative)[8-10,14,17,20,21], *Mulatiff* (Demulcent)[18,19],*Munaffis-e-Balghami* (Expectorant) [114,9,10,20,21], *Musakkin* [14], *Musakkin-e-Atas* (Thirst quenching) [16], *Muteeb-e-Dahan* (Mouth freshener)[14,20], *Muqawwi-e-Aam*(General tonic)[2,8,9,15-19], *Muqawwi-e-Asab*(Nervine tonic)[1,9,10], *Muqawwi-e-Dam* (Haematic)[14], *Muqawwi-e-Bah* (Aphrodisiac)[1,8-10,14-16,18-20,22,24], *Muqawwi-e-Sha'r* (Hair tonic)[13], *Muattir*(Aromatic) [20], *Dafa-e-Hudar* (Anti-rheumatism)[17,22], *Dafa-e-Ziabatees* (Antidiabetic)[22], *Waram-e-Rahem* (Metritis)[11,14,20,21], *Warm-e-Unq-ur-Rahem*(Cervicitis)[26], *Quruh-e-Rahem* (Uterine ulcer) [11], *Atas* (Dyspepsia)[16], *Hujaz Abrya* (Dandruff) [9,10,13,14,20], *Izm-o-Kabid-wa-Tihal* (Hepatospleenomegaly) [8-10, 16,19,22], *Bawaseer* (Hemorrhoids)[8-10,14,16], *Dard-e-Uzn* (Otalgia) [20], *Zof-e-Bah* (Sexual debility)[1,8-10,16,19], *Zof-e-Ishtiha* (Loss of appetite/Anorexia)[6,19,22], *Zaf-e-Aam* (General debility)[6,19,22].

SCIENTIFIC STUDIES ON METHI

Phytochemical Studies

The drug *Hulba* contains chemical constituents, namely vitexin, isovitexin, liquiritigenin, vitamins-thiamine, riboflavin, nicotinic acid,carotene, folic acid, saponins-graecunins H-N, homoorientin, saponaretin, pyridoxine, cyanocobalamine, calcium pantothenate, biotin, vitamin C, carbohydrate-sucrose, glucose, fructose, myoinositol, galactinol, stachyose, traces of galactose and raffinose, xylose, arabinose, proteins, free amino acids like aspartic acid, serine, glutamic acid, threonine, alanine, β-alanine, γ-aminobutyric acid and histidine,fatty acids-palmitic, stearic, arachidic, behenic, oleic, linoleic, linoleic acids, tigogenin, yamogenin, alkaloid-trigonelline, 6β-methylpregnane-3β, 5α,6α,16β, 20α-pentol, (25S)-22-0-methyl-5α-furostan-3β-22,26-triol-3-0-α-rhamnopyranosyl-(1→2) ,trigonellosideC, fenugrin B, furost-5-ene-3β-22, 26-triol, yuccagenin, neotigogenin, quercetin, luteolin, vitexin-7-glucoside, 4-hydroxy-isoleucine,fenugreekine,trigonellagenin, cholesterol, β-sitosterol,arabinoside of orientin or isoorientin, an unknown diglycoside, furanostanol glycoside-trigofoenoside

E,furostanol saponins-trigoneosides Ia, Ib,IIIa, IIIb, furostanol glycoside-trigofoenosides A & D, 3-hydroxy, 4,5-dimethyl-Z-(5H)-furanone, sapogenins, such as diosgenin, gitogenin, neogitogenin,homoorientin, saponaretin,uridine diphosphogalactose 4-epimerase(seed) [25].

Sumayya *et al.*,(2012) conducted a study on the preliminary phytochemical analysis and its quantification was performed in leaves, stem and seeds of different extracts in TFG**.** From the observation, the green leafy vegetable (GLV) were good with regards to phytochemicals. GLV had considerable amount of carbohydrates, phenols, sterols, saponins, quinones, alkaloids, terpenoids and tannins. On the contrary slight presence was reported for proteins, glycosides, flavonoids, leucoanthocyanidines in the GLV and phytochemicals like volatile oils, catechol, cyanogenic glycosides, anthocyanin and lignin were absent. The study was further extended to quantify some of the biochemical constituents like carbohydrates, proteins, chlorophyll and carotenoids in which all revealed its most significant presence. Overall, from the findings of this study, it could be concluded that the selected GLV are immense source of phytochemicals, thus validated this GLV to encourage eating them every day [27].

PHYSICOCHEMICAL STUDIES [1]

Total ash:Not more than 4 %

Acid insoluble:Not more than 0.5 %

Alcohol soluble extractive: Not less than 5 %

Foreign matter: Not more than 2 %

Study on Mucilage of *Hulba*

Karawya*et al.*, (1980) carried out study on mucilages of certain organs of plants abundant in Egypt viz; seeds of *Ceratonia siliqua*L., *Trigonella foenum-graecum* L., *Corchorus olitorius* L., corns of *Colocasia esculenta* Schott. and fruits of *Cordia myxa* L. were studied. Each plant was pretreated to remove interfering substances and the extracted mucilage was also purified from contaminants. The chemical composition of the mucilages was studied by analyzing the hydrolysates quantitatively and qualitatively by thin layer and gas chromatography. Their relative viscosities were also determined [28].

PHARMACOLOGICAL STUDIES

- **Anti-inflammatory and antiarthritic study**

  Pundarikakshudu *et al.*, (2016) carried out a study on the anti-inflammatory and antiarthritic activities of petroleum ether extract of fenugreek seeds. There was 42.5% ($P < 0.01$) reduction in the weight of cotton pellets and significant ($P < 0.01$) reductions in the elevated SGPT and ALP activities in serum and liver of FSPEE (0.5 mL/kg) treated rats. On the basis of results of the study, it was concluded that petroleum ether extract of fenugreek seeds had significant anti-inflammatory and antiarthritic activities which were due to the presence of linolenic and linoleic acids [29].

- **Antidiabetic study**

  In a study carried out by Atila and Yuce (2015) evaluated the antidiabetic activity of the TFG seed extract and chromium picolinate in streptozotocin (STZ) induced diabetes in rats. The results of the study concluded that Crpic might exert its antihyperglycemic effect by facilitating the interaction between insulin and its receptor. Thus, it was recommended that the TFG seed extract and Crpic supplements might help in alleviating or reducing the hyperglycemia-related chronic complications of diabetes [30].

- **Creatine kinase study**

  Genet *et al*., (1999) studied on the creatine kinase activity of insulin mimetic agents like vanadate and fenugreek (TFG) in heart, skeletal muscle of experimental diabetic rats. On the basis of results of the study, all the antidiabetic compounds used namely insulin, vanadate and fenugreek seed powder normalized the decreased activities to almost control values [31].

- **Hypolipidemic study**

Kamal *et al.,* (1993) carried out a study on efficacy of the steroidal fraction of fenugreek seed extract of fertility of male albino rats. The results of the study found satisfactory and efficient [32].

Another study carried out by Kamal *et al.,* (2000) on contraceptive efficacy of steroidal extract of fenugreek on male albino rats, and the results found satisfactory and efficient [33].

Khosla *et al.*, (1995) carried out a study on effect of Fenugreek in the form of unroasted and roasted powdered seeds which was given in low (2 g/kg) and high (6 g/kg) dose to normal and alloxan-induced Diabetic rats. The results of the study showed that both the unroasted and roasted forms produced a significant fall in various serum lipids like total, triglycerides, LDL and VLDL cholesterols in normal rats; decreased their raised levels and increased HDL cholesterols in normal rats; decreased their raised levels and increased HDL cholesterol in the diabetic rats [34].

- **Hypoglycemic study**

  A study was carried out by Khosla *et al.*, (1995) on short communication effect of *Trigonella foenum-graecum* (fenugreek) on blood glucose in normal and diabetic rats. TFG was administered at 2 and 8 g/kg dose orally to normal and alloxan induced diabetic rats. The results showed significant fall ($P < 0.05$) in blood glucose both in the normal as well as diabetic rats. It was concluded that the hypoglycaemic effect was dose related [35].

  In an another study by conducted by Losso *et al.*, (2009) on the role of fenugreek bread in the treatment of diabetes mellitus was found to be very significant, especially in combination with other plants. The mechanism of action of Fenugreek in the control of blood glucose and insulin resistance unbalanced diabetes was studied. The study indicated that 1 g/day hydro-alcoholic extract of fenugreek seeds for 2 months provided better control of blood glucose and a decrease in insulin resistance [36].

- **Antistress study**

  Pawar and Hugar (2012) studied the adaptogenic activity of methanolic extract of *Trigonella foenum-graecum* seeds (METFGS) at 100, 250 and 500 mg/kg doses against anoxia stress tolerance in mice and immobilization stress models. The results of the study showed marked increase in anoxia stress tolerance time. Thus, it was concluded that METFGS possessed significant anti stress activity [37].

- **Antioxidant study**

  Subhashini*et al.,* (ynm) carried out a study on antioxidant activity of ethanol (70%) extract of *Trigonella foenum-graecum* (EETFG). The results of the study showed that the extract offered strong antioxidant activity in a concentration dependent manner [38].

- **Analgesic, neuropharmacological and cytotoxic study**

  Akter *et al.,* (ynm) evaluated analgesic, neuropharmacological and cytotoxic activities of the methanolic extract of TFG leaves in mice. The results of this study suggested that the extract possessed analgesic, cytotoxic and CNS depressant activities [39].

- **Estrogenic study**

  Sreeja *et al.,* (2010) studied the effect of chloroform extracts of fenugreek seeds (FCE) in breast cancer cells for its estrogenic effect and assessed its capacity as an alternative to hormone replacement therapy (HRT). The results of the study suggested that FCE stimulated the proliferation of MCF-7 cells, showed binding to ER (IC_{50} = 185.6 ± 32.8 µg/ml) and acted as an agonist for ER mediated transcription

via ERE. Thus, it was concluded the evidence for estrogenic activities of fenugreek seeds [40].

- **Insulin sensitivity study**

  Mohammadi *et al.,* (2016) studied effect of TFG water extract on insulin sensitivity and stimulation of PPAR and γ gene expression in high fructose-fed insulin resistant rats. The results showed insulin (49.02±6.93 pmol/L),adiponectin (7.1±0.64 µg/ml), and triglycerides(110.3±16.7 mg/dl), which were significantly different and improved compared to the control group insulin(137± 34 pmol/l),adiponectin (3.9± 0.15 µg/ml), glucose (187 ±15 mg/dl), and triglycerides(217± 18 mg/dl).The PPARγ gene expression was also significantly increased compared to the control group. The study concluded the beneficial effect of TFG extract on insulin resistence in rats fed on a high-fructose diet [41].

- **Chemical study**

  Chatterjee *et al.,*(2010) studied neutral and polar lipids of fenugreek's seeds.Triacylglycerol and phosphatidylethanolamine were the major molecular species identified in the neutral and polar lipid fractions, respectively. The fatty acid profile was dominated by unsaturated acids, namely oleic, linoleic and linolenic acids accounting for 16.3,50 and 24.4%,respectively of the total fatty acids. Besides the major molecular species, N-Acyl phosphatidylethanolamines(NAPE) and fatty acid amides were isolated and identified for the first time in this spice. N–linoleylphospha-tidylethanolamine was found to be the major fatty acid amide in the lipid fraction [42].

- **Nutritional study**

  Frias *et al.*, (2007) carried out a study on biogenic amines and HL60 citotoxicity of alfalfa and fenugreek sprouts. The Results obtained in HL60 leukemic cells showed apoptosis, cell proliferation and cell viability valued similar to those found for distilled water and no toxic effects were observed. The results of the study provided support for the use of germinated alfalfa and fenugreek seeds as ingredients in functional foods [43].

- **Antiulcer study**

  Suja *et al.*, (2002) conducted an experimental antiulcer activity on fenugreek and its protective effect against ethanol induced gastric damage in rats. In this study, histological studies revealed that the soluble gel fraction derived from the seeds was more effective than omeprazole in preventing lesion formation. Thus, it was concluded the evidence for antiulcer activity of fenugreek seeds [44].

- **Antioxidant and hepatoprotective study**

  Meera *et al.*, (2009) studied the significant hepatoprotective and antioxidant activity obtained by ethanolic extract of TFG against liver damage induced by H_2O_2 and CCL_4. The extract also showed significant anti-lipid peroxidation effects *in vitro,* besides exhibiting significant activity in superoxide radical and nitric oxide radical scavenging, indicating their potent antioxidant effects. Thus, it was concluded that the evidence for antioxidant and hepatoprotective activity of TFG [45].

- **Cosmetological study**

  Kole *et al.*, (2005) reviewed *Hulba* that it had aphrodisiac, astringent, cooling, demulcent and emollient properties. It offered many dermatological solutions for complete skin and mucous membrane. It was mentioned as demulcent, nutritive and exigenic properties of the plant. Cosmetic applications were in hair care, hair loss, hair growth, hair colouring, skin cleansing, skin toning and stimulation, and useful for facial skin care. It was also mentioned that the seeds are emollient and accelerated the healing of suppurations and inflammation externally [46].

CLINICAL STUDIES

- **Haemopoitic study**

  Megha *et al.,* (2012) studied in randomized clinical trial effect of TFG (Fenugreek/ *Methi*) on hemoglobin levels in females of child bearing age. This clinical trial proved that the fenugreek seeds rich in proteins with essential amino acids, iron, ascorbate and folate content have restorative and nutritive properties. Thus, it was evidenced for haemopoitic activity of fenugreek [47].

- **Androgenic study**

  Elizabeth *et al.*, (ynm) evaluated the effect of Testofen, a standardized Fenugreek extract and mineral formulation on male libido (sexual drive, urge or desire) in a double blind randomized placebo controlled study. On the basis of results of the study, it was concluded that Testofen demonstrated a significant positive effect on physiological aspects of libido and might assist to maintain normal healthy testosterone levels. Thus, it was found that fenugreek had androgenic activity [48].

- **Antidiabetic study**

  Yaheya and Ismail (2009) conducted a clinical trial for the antidiabetic activity of fenugreek seeds (FG) and Bael leaves (BL) (*Aegle marmelos*) individually and collectively in non insulin dependent diabetes mellitus (NIDDM) patients. On the basis of results, FG powder 20gm and decoction of 5gm BL powder individually once daily orally were found to have antidiabetic effect [49].

- **Hypolipidemic study**

  Prasanna (2000) studied a clinical trial for the hypolipidemic effect of fenugreek in hypercholesterolaemic patients. The result of the study showed that there were no significant changes in lipid profile of Group-I patients. In Groups-II and III serum cholesterol, triglycerides and VLDL levels were significantly decreased when compared to group I. Thus, it was concluded that FG powder given orally before food at 25 and 50 gm twice a day might have hypolipidemic effect in hypercholesterolemia patients [50].

- **Allergenicity and antigenicity study**

  Kruse *et al.*, (2009) studied the allergenicity and antigenicity of fenugreek proteins using patient sera and a newly developed polyclonal anti-fenugreek antibody. Thus, fenugreek seed powder, an ingredient in spiced foods, contained several potential allergens. More evidences were found for a high rate of cross-reactivity to peanut [51].

CONCLUSION

Unani medicines are becoming popular among the society to avoid side effects of conventional therapies. In recent scenario, there has been a growing concern in the nutraceutical potential of various herbs which provide health benefits along with their nutritional benefits. Thus, the practice of herbal plants like methi is rapidly gaining momentum. It is widely used in cosmetic and flavoring industries. It is included in the formulations used for cholasma, improving complexion and beautification. A paste of the seeds is used as a cosmetic to keep the skin smooth and clean. Traditionally, it has been used for both culinary and medicinal purposes. It is a well-known ingredient of spice blends which prevents ageing, imparts immunity, improves mental function, labour pain and adds vitality to the body. This review provides extensive information on the medicinal uses of methi and supports its potential as a promising health promoting herbal plant. Thus, more researches can be done to exploit the unexplored potentials of methi which have already been mentioned in ancient Unani classical literature.

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