Scientific Name(s) : *Trigonella foenum – graceum* L.

Local Name(s) : Helba
Arabic Name(s): Helba, Basbasa, Hulba
Common Name(s): Fenugreek

Family: Fabaceae (Leguminosae)
Sub-Family : Papilionaceae

**Description :**
Annual herb 50-70 cm high. Glabrous or pubescent, stem erect. Leaves trifoliate, stipules triangular.; leaflets obovate to oblong, 10-30 mm long, 5-15 mm wide, obtuse to truncate at apex, narrowed towards the base; margins shallowly serrate to dentate; glabrous. Inflorescences short, axillary racemes; flowers small , white or cream, sessile or subsessile, solitary or paired, 13-18 mm long. Fruits sickle-shaped, glabrous pods, 6-10(15) cm long, 3-5 mm wide, sub cylindrical, tapering to a straight beak 2-3 cm long. Seeds 3-6, oblong compressed, smooth, dark yellow to light brown when dry.

**Habitat & Distribution:**
The plant is generally distributed in North Africa, Eastern Mediterranean and is cultivated all over the world and naturally grows in sandy, silty and clay soils. In UAE it is cultivated in private farms.

**Part(s) Used:**
Seeds and aerial parts

**Traditional & Medicinal Uses :**
The plant is tonic, emollient, lactagogue, nutritive, stomachic, diuretic, carminative, emmenagogue, condiment, aphrodisiac, expectorant, antidiabetic, anabolic, appetizer,
insect repellent. Used orally to treat cough, asthma, dysuria, constipation, hemorrhoids, diarrhea, gastrointestinal problems, impotency, backache, bladder & liver problems; and topically to treat tonsillitis, throat infections, swellings, abscesses, tumors and burns, scalp infection and dandruff and for hair and skin care & beauty. Fenugreek is a good source of sex hormones thus used for impotency and menopause.

**Pharmacognosy and Phytochemistry**

Parts used: Seeds

**Microscopic Description:**

The widest surfaces are marked by a groove that divides the seed into two unequal parts. The smaller part contains the radicle, the larger part contains the cotyledons. The seed testa is covered with a thick cuticle. The epidermis of the testa is composed of compact polygonal cells that have palisade-like shapes and straight cell walls and they contain a yellowish brown pigment. The epidermis is underlain by a single layer, the hypodermis, which is composed of characteristic colourless cells that have rod-like thickenings. The hypodermis is underlain by few layers of thin walled compact parenchyma cells. These are followed by the outer-most layer of the seed endosperm which has thick-walled cells. These cells are surrounding the endosperm mucilage cells. The cotyledons have compact parenchyma cells with thin cells walls. The powder is yellowish-brown. Under the microscope the powder shows fragments of the testa in sectional view with thick cuticle covering palisade-like epidermal cells with an underlying hypodermis of large cells, narrow at the upper end and constricted in the middle, with bar-like thickening of the radial walls. (DPS ZCHRTM Unpub. Results)

(a). Surface view for the epidermal cells of the testa from below showing the compactly packed cells. (b). The hypodermis of the testa in surface view from above. (c). Layers of rod-like parenchyma cells of the palisade tissues of the cotyledons in sectional view. (Magnifications: All x 400).
Organoleptic characteristics:
Appearance: Solid- rhomboidal seeds
Colour: Yellowish brown-light brown
Odour: Specific of its own
Taste: Bitter

Physicochemical constants:

Loss in weight on drying at 105°C (%): 5.80-7.00

Solubilities (%)
Alcohol solubility: 6.4
Water solubility: Not possible
10% Ethanolic extractive: Not done

Ash values (%)
Total ash: 3.50—6.00
Water soluble ash: 1.88-2.78
Acid-insoluble ash: 0.42-1.50

Successive extractive (%)
Petroleum ether (60-80°C): 6.83
Chloroform: 0.54
Absolute alcohol: 8.20
Distilled water: 5.80-6.00

pH values
pH of 1% solution: Not possible
pH of 10% solution: Not possible

The above results are under process of publication (DPS ZCHRTM Unpub. Results).

Chemical constituents:
Fenugreek seed contains carbohydrates, mainly mucilaginous fibre (galactomannans); proteins, fixed oils (lipids), alkaloids, mainly trigonelline, gentianine, flavonoids, apigenin, luteolin, orientin quercetin, vitexin & isovitexin. Free amino acids as 4-OH-isoleucine. Vitamins A, B & C, saponins and steroids. (DPS, ZCHRTM Unpub. results).

Pharmacology and Toxicological studies:

Trigonella foenum graecum (Fenugreek) was investigated in alloxan induced subdiabetic and overtly diabetic rabbits of different severities. A sustained hypoglycemic effect was observed (Puri et. al., 2002). T. foenum graecum showed a stimulatory effect on immune functions in mice. (Bin Hafeez et. al., 2003).

One hundred infested patients (90 females and 10 males) with different age and hair length were treated with mixed cream from plants Lawsonia alba L., Trigonella foenum-gracanum (Fenugreek), Hibiscus cannabinus and Artemisia cina. The head lice completely disappeared within a week among those patients treated by Lawsonia
mixed with aqueous extract of sheath (100%) or mixed with helba (75%) or with karkada (50%). (El-Basher and Faoud, 2002). Beneficial effects of Trigonella seedshave been demonstrated in diabetic animals and both insulin-dependent and non-insulin-dependent diabetic subjects (Al-Habori et. al., 2001). Findings indicate that *Trigonella* seed may prove to be effective in the treatment of thyroxine-induced hyperglycaemia. (Tahiliani et. al., 2003). The extract also showed a positive effect on glucose disposition in glucose fed hyperglycemic rats. (Vats et al., 2002). The aqueous extract of *Trigonella* effectively reduced blood glucose in normal subjects safely. Its hypokalaemic effect merits further investigation (Adel-Barry et. al., 2000). Trigonella seed powder lowered the glucose level to almost control values. The effects of insulin and vanadate were comparable in restoring normoglycemia and the creatine kinase activities. (Genet, Kale, et. al., 1999). Chronic administration of *Trigonella* seed extract enhances food consumption and motivation to eat in rats and also induces hyperinsulinemia as well as hypocholesterolemia. (Petit et. Al., 1993).

The results indicate that the *Trigonella foenum-graecum* leaves extract possess anti-inflammatory as well as antipyretic properties following both i.p. and p.o. administration. The possibility of alkaloids as antidiabetic compounds, in this extract, is suggested (Ahmadiani et. al., 2001). The extract of *Trigonella* leaves produces antinociceptive effects through central and peripheral mechanisms (Javan., 1997).

The study was carried to determine the acute toxicity of the leaf glycosidic extract of *Trigonealla* by estimation of its medium lethal dose (LD<sub>50</sub>). It is concluded that the glycosidic extract of *Trigonella* leaves is considered to be safe and have minimal adverse effect (Abdel-Barry and Al-Hakiem. 2000). The plant did not produce any significant acute and cumulative toxicity at the doses administered, as reflected by the various toxicity parameters investigated (Muralidhara, et. al., 1999).

The pharmacological and toxicological studies carried out in our laboratory and the results in brief, on *Trigonella foenum-graecum* (Aqueous extract) have been given below. The results presented without references showed unpublished data (UPD, ZCHRTM, DBMS):

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>RESULTS</th>
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<tbody>
<tr>
<td>Anti-diabetic activity-GTT acute</td>
<td>Extract did not show significant hypoglycaemic</td>
</tr>
<tr>
<td>Anti-diabetic activity-GTT sub acute</td>
<td>Extract did not show any hypoglycaemic activity</td>
</tr>
<tr>
<td>Anti-diabetic activity-STZ-acute</td>
<td>Extract did not improve glucose tolerance</td>
</tr>
<tr>
<td>Anti-diabetic activity-STZ-subacute</td>
<td>Extract did not improve glucose tolerance</td>
</tr>
<tr>
<td>Anti-diabetic activity-STZ and GTT</td>
<td>Glibenclamide as positive standard showed glucose lowering effect in both the models studied</td>
</tr>
</tbody>
</table>
Cardiotonic activity & HR
Isolated rat atria
No effect on force or rate of contraction were observed.

Effect on GIT smooth Muscle
Isolated rabbit jejunum
Transient initial increase in amplitude which was normalized.

Effect on GIT smooth Muscle
Isolated rat fundus
Extract produced no significant effect.

Gross behavioral studies
Tremor/Twitches
No tremors and twitches observed.

Gross behavioral studies-
Writhing
No abnormal signs and symptoms.

Gross behavioral studies-
Diarrhea, Urination
No diarrhea observed.

Mortality
No mortality recorded.

Motor co-ordination (String & Platform test)
Motor co-ordination not affected.

Acute toxicity studies-
No toxic signs and symptoms observed, at the dose tested.

Summary of the results:
Various studies have been made on Trigonella foenum graecum (Fenugreek) using alkaloid rich fraction, steroid saponin containing extract, defatted seed powder, and sub-fraction of the seeds. The hypoglycaemic activity has been reported to produce a modest and transient hypoglycemic effect in healthy and mildly diabetic animals. The results have been attributed to fiber content and delayed intestinal absorption of glucose. In the present study aqueous extract of the seeds was screened for hypoglycaemic activity in both the models studied. Further studies are needed to work on sub-fractions of the seeds and also on acetone, CCI 4 and other possible extracts to confirm the hypoglycemic activity.

The extract did not show cardiotonic activity. The haematolytic activity reported in the literature was not confirmed in our experiment. The acute and sub-acute administration of the extract in mice at the dose tested showed no major signs and symptoms of toxicity and produced no mortality. However, acute administration of higher dose showed mild, but transient abnormal symptoms.

Reference:


• **Andrews, F.W.** The Flowering Plants of Anglo-Egyptian Sudan; (1950&1952) vol I+II; Arbroath, Scotland.


• **Department of Biomedical Sciences, Zyed Complex for Herbal Research and Traditional Medicine, Unpublished results.**

• **Department of Pharmacognostic Sciences, Zyed Complex for Herbal Research and Traditional Medicine (ZCHRTM), unpublished results.**


