



An ISO 9001:2008 Company

IEC No.:1312 00 5386

TIN No.: 08262711414

CHEMTOTAL LABS PVT. LTD.

17E/804, CHB, Jodhpur,
Rajasthan. INDIA-342001

E-mail: india@chemtotal.com

Ph:+91-9799716055,

+91-291-2703946

Introduction:- Fenugreek (*Trigonella foenum-graecum*) seeds are rectangular to oval in shape with deep grooves between radicle and cotyledon, it varies in color from dirty orange to golden yellow. It consists of two endosperm halves which are galactomannan by nature. Fenugreek gum is the milled endosperm of fenugreek seeds. The galactomannan consists of approx 35-50% of the overall weight of the seed. Rest of the seed is germ is rich source of protein. According to Srichamroen et al. (2005), the fenugreek seed is composed of following chemicals :-

1. Galactomannan
2. Steroidal sapogenins
3. Isoleucine

Fenugreek is a unique galactomannan having high rate of galactose substitution (Mannose to Galactose, M:G = 1:1), this is the reason fenugreek gum is more cold water soluble as compared to any other galactomannan.

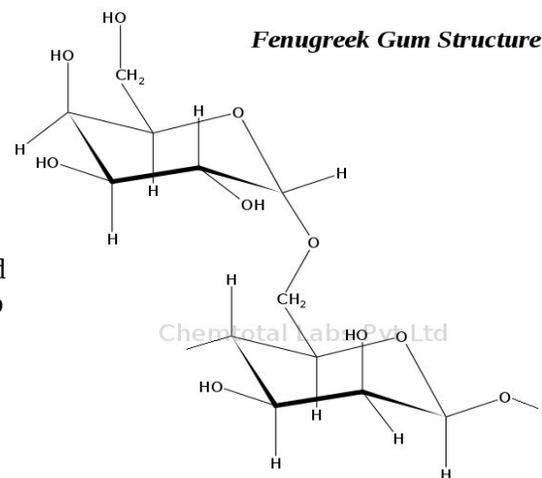
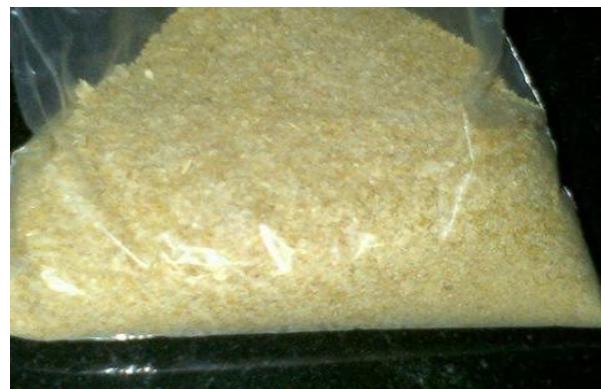
Fenugreek gum is yellow-brown in color and changes to near see through gel when hydrated. The polysaccharide content in the gum ranges from 60 – 80%.

Structure :- Fenugreek gum has the typical galactomannan structure of 1 → 4 linked β-D-mannosyl backbone with single unit galactose side chains, α-linked at the O-6 oxygen.

Chemical Properties :- Fenugreek gum has a molecular weight of range 5.0×10^5 to 9.5×10^5 D. The gum is neutral in nature, but like guar gum it achieves complete hydration in water with time. The size of particle is inversely proportional to the hydration rate i.e. with decrease in particle size the hydration rate increases. FG solutions show non-Newtonian properties, whose viscosity is reduced with the increase in shear and temperature. FG does not show synergism with k-carrageenan or xanthan.

Fenugreek gum vs Guar Gum :- Fenugreek yields less viscosity as compared to guar, but has considerably good hydration rate. Fenugreek having M:G ratio of 1:1 has more affinity for water as compared to guar whose M:G ratio is 1:2. FG yields low viscosity as compared to GG, because it has a low molecular weight and lacks tendency to create molecular aggregates.

As discussed by Garti et al. (1996), Fenugreek gum is best at reducing the surface tension as compared to guar gum and has the inter-facial activity better than any other commercially available galactomannans. FG is more efficient than other hydro-colloids and gums in decreasing the inter-facial free energy, its emulsions are composed of tiny & uniform oil droplets ($70\% < 1\mu\text{m}$). Thus it is recommended to use FG and GG blend for emulsion applications. FG can provide emulsion stability and GG can further help in emulsion stability with greatly increasing the viscosity.





An ISO 9001:2008 Company

IEC No.:1312 00 5386
TIN No.: 08262711414

CHEMTOTAL LABS PVT. LTD.

17E/804, CHB, Jodhpur,
Rajasthan. INDIA-342001
E-mail: india@chemtotal.com
Ph:+91-9799716055,
+91-291-2703946

FG manufacturing methods :-

Dry Method :-

1. Washing and Hydrating the splits

Take Split in mixer then add water (approx 25%) and others chemical accordingly and stir so that the mixture is even. Brummer et al. (2001) reports the gum making of fenugreek gum from defatted, deactivated fenugreek seeds with record low protein contaminates. The gum solution is washed with pronase to reduce protein contaminates.

Gums are reported to be washed by Methyl or Ethyl alcohols for eliminating any bacteria. Such washing can be adopted for highly pure FG grades with controlled bacteria count.

2. Flaking

The wet splits are then be transferred into Roll Mill Flakers through conveyors . In addition splits can be extruded so as give final product even better solubility (Hydration & Hydration acceleration rates). Roberts et al. (2010), states the difference in extruded and non-extruded FG in bread-making and concludes that the addition of extruded FG to bread dough increases the water absorption capacity of dough as compared to no-extruded FG. Therefore extrusion is recommended where the application requires greater viscosity and water holding capacity.

3. Drying

The wet split Flakes are transferred into Roll Mill Dryers through conveyors.

4. Grinding

The Dry Guar Flakes are transferred into Micronizer through conveyors .

5. Separation

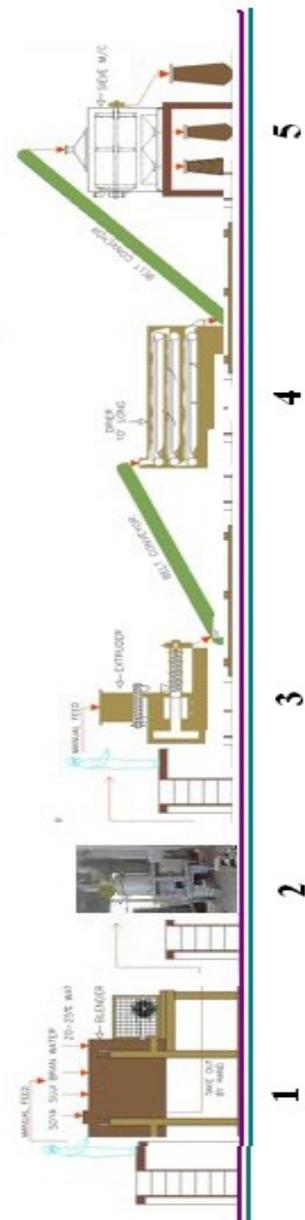
The grinding Powder will transfer into Sifter for separation 100 mesh ,200 Mesh & 300 Mesh through conveyor .

6. Blending & Packaging

The required fine powder transfer into blender for blend other chemicals and filler according to products through conveyors .

Wet Method :-

Garti et al (1996) demonstrated a wet method of purification of the FG. They ground dry fenugreek seeds to powder of 300 mesh, extraction is carried out by Soxhlet procedure in





An ISO 9001:2008 Company

IEC No.:1312 00 5386

TIN No.: 08262711414

CHEMTOTAL LABS PVT. LTD.

17E/804, CHB, Jodhpur,
Rajasthan. INDIA-342001

E-mail: india@chemtotal.com

Ph: +91-9799716055,

+91-291-2703946

presence of n-hexane for nearly 5 hours until the solution is colorless. Most of the lipids are dissolve in n-hexane solution which is discarded. The solids are further treated with methanol and then ethanol. After the vacuum evaporation and lypolization of extract is dissolved in water to obtain raw fenugreek gum. After the repetition of extraction process (approx 4 times) the water soluble and hydro-colloid fractions are precipitated by adding ethanol. The end product is then ground to fine powder.

Fenugreek Standard Codes :-

| | CAS No. | HS Code |
|----------------------|-------------|----------|
| Fenugreek Seed | 977155-29-5 | 09109912 |
| Fenugreek Extract | 84625-40-1 | - |
| Fenugreek Oleo-resin | 977018-40-1 | - |

Possible Derivatives of FG :-

Non-ionic derivatives—Alkyl (methyl, ethyl, and allyl) and hydroxyalkyl (hydroxyethyl or HE and hydroxypropyl or HP).

Anionic derivatives—Carboxymethyl (CM) and carboxymethyl hydroxypropyl (CMHP; a double derivative), carboxyethyl, sulfate esters, phosphate esters, and sulfonic (sulfoalkyl).

Cationic derivatives—Pri-, sec-, and tert-aminoalkyl and quaternary derivatives.



An ISO 9001:2008 Company

IEC No.:1312 00 5386

TIN No.: 08262711414

CHEMTOTAL LABS PVT. LTD.

17E/804, CHB, Jodhpur,
Rajasthan. INDIA-342001

E-mail: india@chemtotal.com

Ph:+91-9799716055,

+91-291-2703946

References :-

Srichamroen A, Field CJ, Thomson AB, Basu TK. "The Modifying Effects of Galactomannan from Canadian-Grown Fenugreek (*Trigonella foenum-graecum* L.) on the Glycemic and Lipidemic Status in Rats." Journal of Clinical Biochemistry and Nutrition 2008 43(3):167-74.

Garti N, Madar Z, Aserin A, Sternheim B, "Fenugreek Galactomannans as Food Emulsifiers", *LWT – Food Science and Technology, Volume 30, Issue 3, Page 305-311.*

Roberts K, Cui S, Chang Y, Ng P, Graham H, "The influence of fenugreek gum and extrusion modified fenugreek gum on bread", *Food Hydrocolloids, Vol. 26, Issue 2, Page 350-358.*

Brummer Y, Cui W, Qang Q, "Extraction, purification and physicochemical characterization of fenugreek gum", *Food Hydrocolloids, Vol. 17, Issue 3, 2003, Page 229-236.*

Garti N, Aserin Abraham, Madar Z, Sternheim, "Galactomannan product and compositions containing the same", Patent no. 587109, 1998. viewed online (<http://www.google.com/patents/US5847109>)