



PROCESSING OF FENUGREEK



AATMANIRBHAR BHARAT

**PM Formalisation of Micro Food Processing
Enterprises Scheme (PM FME Scheme)**

FENUGREEK

- Fenugreek's botanical name is *Trigonella foenum-graecum*
- Fenugreek has two areas of origin: the Indian subcontinent and the Eastern Mediterranean Region
- It is believed that fenugreek was known in the Indian cuisine even 3,000 years ago
- Its growth in the wild is reported from Kashmir, Punjab and the Upper Gangetic plains



INTRODUCTION

- It is one of the most common vegetables grown throughout the Country.
- Fenugreek is a leguminous annual plant that grows to around 60 cm tall
- The leaves are similar to clover in shape.
- Flowers are pea-shaped and yellow or white and appear in the leaf axils.
- White flowers appear in early summer and develop into long , slender , yellow- brown pods containing the brown seeds
- Like other legumes, the seeds are held in pods.
- Fenugreek pods are thin and crescent-shaped.
- The light brown seed harvested from the dried pods has a strong³ curry flavour.

FENUGREEK PLANT PARTS



FENUGREEK SEEDS



FENUGREEK LEAVES

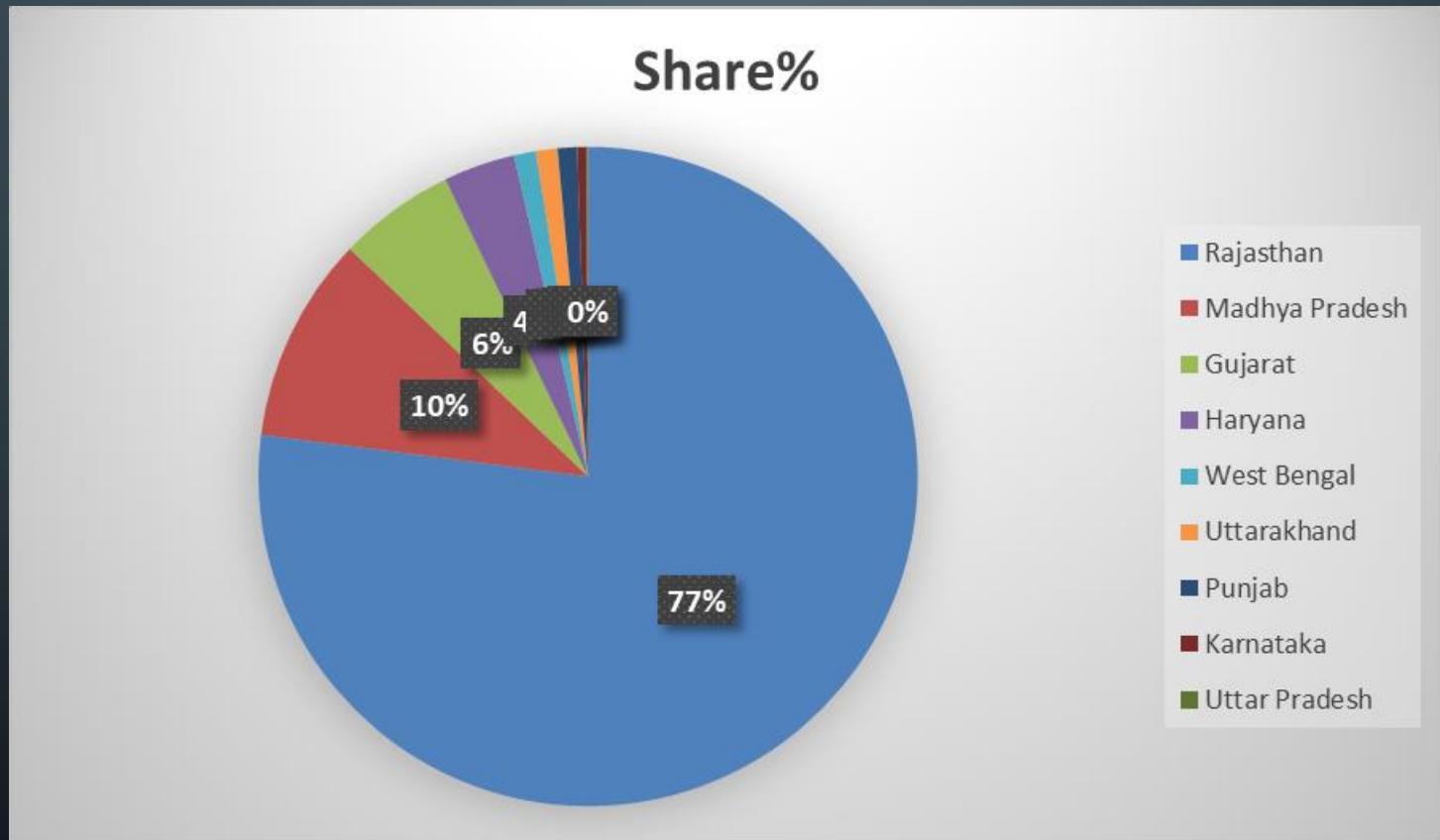


FENUGREEK
FLOWERS

FENUGREEK PLANT MARKET

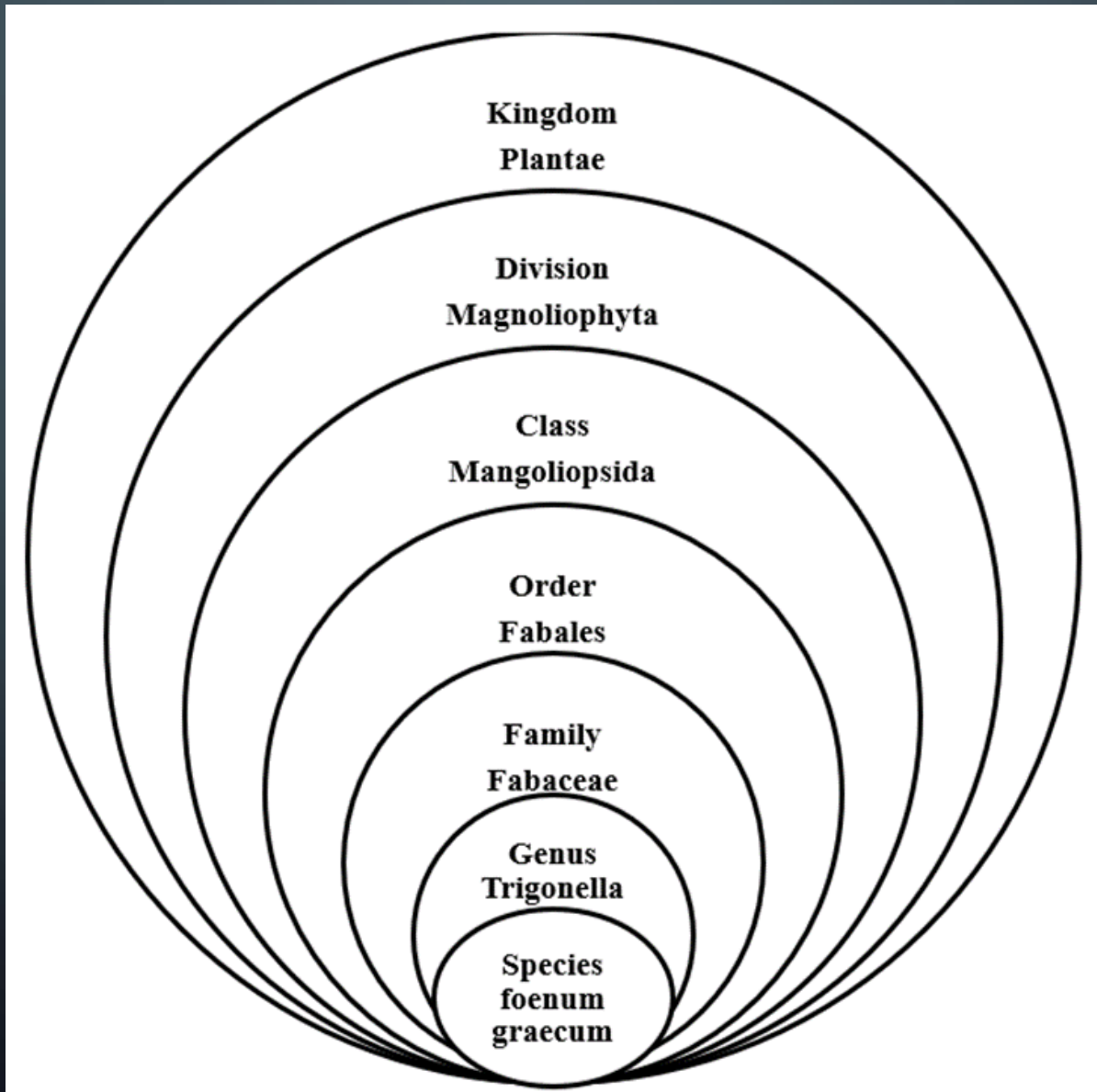
- Its seed is traded as a spice, and in an oil extract form as oleoresin
- The major seed producing countries are India, Ethiopia, Egypt and Turkey. India is the largest producer of fenugreek in the world
- Within the country its seed production is the highest in the state of Rajasthan
- Main fenugreek growing district in Rajasthan are Sikar, Jaipur, Nagaur, Kota, Jhalawar, Baran and Chittorgarh

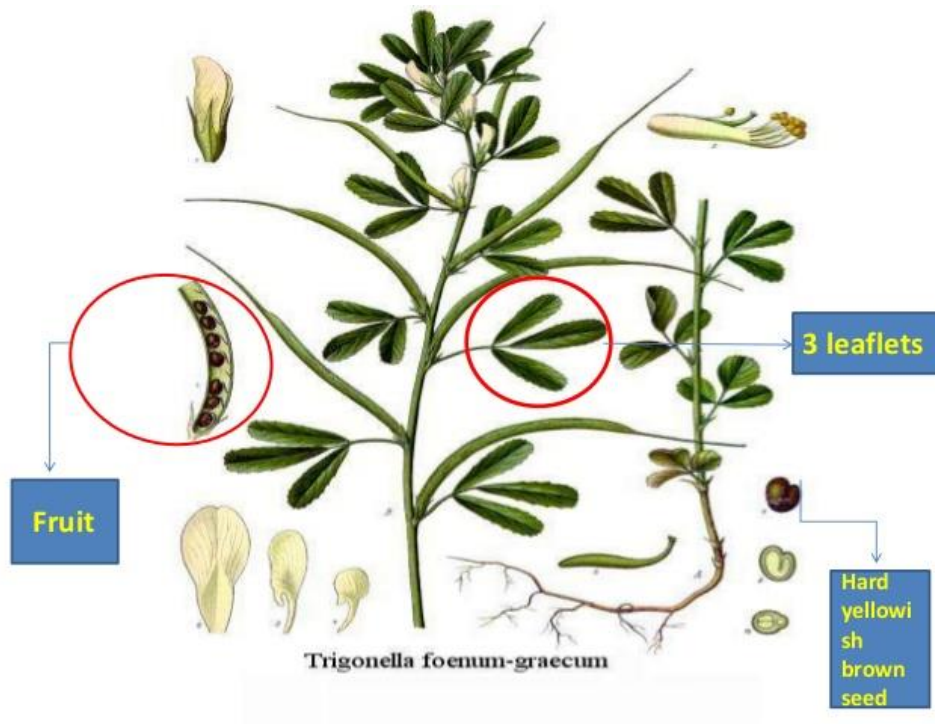
SHARES OF DIFFERENT STATES IN FENUGREEK PRODUCTION (2015-16)



Data Source: National Horticulture Board (NHB)

TAXONOMY OF FENUGREEK





FENUGREEK PLANT

- Depicts leaflet, fruit and seed of fenugreek plant

OTHER COMMON NAME IN DIFFERENT LANGUAGE

S.No.	Local Name	Language	State
1	Methi	Hindi, Oriya, Bengali, Punjabi and Urdu	Haryana, Odisha, West Bengal, Punjab
2	Methya	Marathi	Maharashtra
3	Menthya	Kannada	Karnataka
4	Vendayam or Venthayam	Tamil	Tamil Nadu
5	Menthulu	Telugu	Andhra Pradesh
6	Uluva	Malayalam	Kerala
7	Medhika or Chandrika	Sanskrit	-

CULTIVATION AND HARVESTING



- It can be grown in plains throughout the year .
- Mostly Rabbi season (Sept-Oct) is good for the cultivation but can be grown during rainy Season as well.
- It require cool climate during vegetative growth & warm dry climate during maturity and well drained loamy soil suits (pH6-7)
- Harvesting - Ideal time for harvesting is when the lower leaves of the plant start shedding and pods become yellowish in color.
- Harvesting is done manually by cutting the plants with sickles. Delay in harvesting may lead to shattering of seeds

DIFFERENT VARIETY GROWN

Name	Description	Color of the seed	Resistance To Rot	Average Yield	Maturity
RMt 1	Semi-erect, tall and moderately branched plants	bold and yellow grains	Moderate	14.7 q/ha	140–150 days
Co 1	Short and green with medium-sized plants	brownish-orange seeds	tolerant	6.80 q/ha	95 days
Rajendra Kanti	Tall and bushy green plants	golden-yellow seeds	moderately	12.50 q/ha	120 days
Lam Selection 1	Bushy, green with medium-sized	golden yellow seeds	tolerant	7.40 q/ha	90 days
HM 103	Bushy, semi-erect	yellow, attractive seeds	moderately	20.1 q/ha.	140–150 days
Hissar Sonali	Bushy, semi-erect	bold, yellow, attractive grains	moderately	19.0 q/ha	140–150 days

SALIENT FEATURES OF VARIETY

Variety	Parentage	Institution	Salient features
Lam selection 1	Selection from germplasm	ANGRAU, AP	Tolerant to powdery mildew, root rot, caterpillars and aphids
Pusa Early Bunching	NA	IARI	Resistant to downy mildew, rots
Rajendra Kranti	Pure line selection from Reghunathpur local	COA, Murzhapur	Tolerant to leaf spot, suit for intercropping
Hissar sonali	Pure line selection from local	HAU, Haryana	Moderately tolerant to root rot, aphids
Co.1	Selection from germplasm	TNAU	dual purpose variety evolved at TNAU Tolerant to root rot
RMt- 1	Pure line selection from Naguar local	RAU, Jobner	Moderately resistant to root rot and tolerant to powdery mildew
RMt- 143	Pure line selection from local	-do-	Seeds mature 140-150 days after sowing, Moderately resistant to powdery mildew

PROXIMATE COMPOSITION

Components	Plant
Carbohydrate	58%
Fat	6-7%
Protein	23-26%
Moisture %	11%
Ash	3%
Fiber	25% of carbohydrates
Iron	33mg/100g

Wani et al., 2018

Components	Leaves
Carbohydrate	6%
Fat	0.9%
Protein	4.4%
Moisture %	86.1%
Ash	1.5%
Fiber	1.1%
Ascorbic acid	220.97 mg/100g
b-carotene	19 mg/100g

Wani et al., 2018

Components	Seed
Carbohydrate	45-60%
Fat	7.5%
Protein	20-30%
Moisture %	5-10%
Ash	3-4%
Vitamin B1	0.1137 mg/g
Vitamin B2	0.0366 mg/g
Vitamin B6	0.0495 mg/g
Vitamin B12	0.8710 mg/g
Vitamin C	10.54 mg/g

Rashid et al., 2018; Buba et al., 2015

POST HARVEST PROCESSING OF LEAVES

After harvesting of fenugreek leaves

- Washing is done
- Bounded in 'Judi'
- Packed in cloth or netted bags or put in bamboo baskets
- Used for fresh vegetable consumption i.e. paratha and curry or seasoning

Fresh Leaves have only 4-5 days shelf life after drying the shelf life can be increased to 1-2 years.



DRYING OF FRESH LEAVES

Fresh leaf washing

Blanching

Drying (sun or tray drying)

Dried leaf packaging

Grinding of leaf to get powder



a)

b)



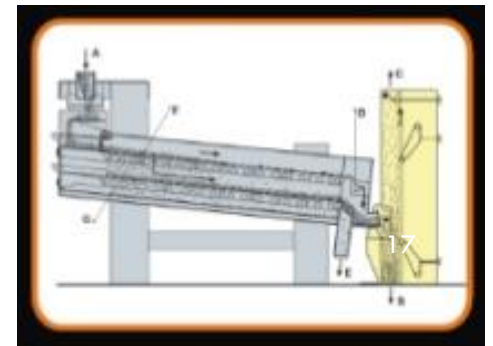
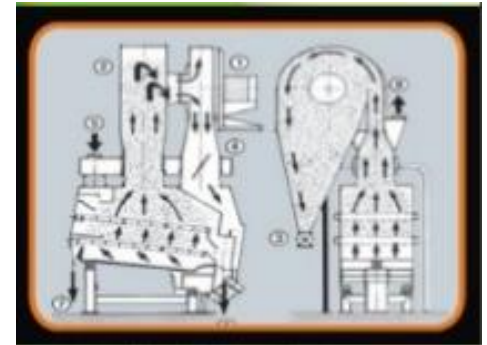
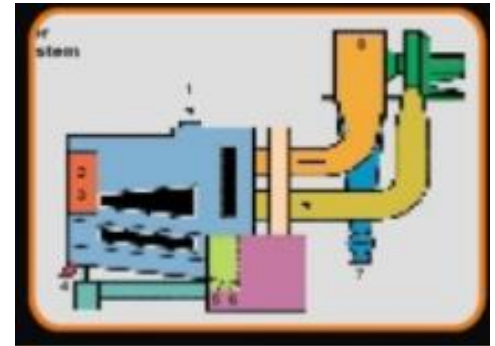
POST HARVEST PROCESSING OF SEEDS (DRYING OD SEEDS)

- **Threshing** -is a process by which seeds are separated from the plants. Manual threshing is normally done on clean cemented floor
- **Cleaning and Grading** -Separated seeds are heaped together on the floor which is then cleaned of dust and straw by using winnowing fans.
- **Drying** – seeds are dried using sun drying or conventional driers
- **Packaging**: Disinfested jute bags or LDPE are used for packing fenugreek seeds and these bags are stored in damp-free aerated stores.
- **Grinding**: Seeds are grinded if required and stored airtight packaging material



INDUSTRIAL PROCESSING

- **Destoning** - Reliable removal of high-density impurities such as stones and pieces of metal and glass is achieved on the basis of differences in specific gravity. (Destoner MTSC)
- **Combinator**- For the classification of grain into heavy, and removal of light impurities with additional destoning. (MTKB - Combi-Cleaner with air-cycling system)
- **Separation and Classification** - Classifies various products according to size. Excellent separating efficiency. (Buhler Separator Classifier MTRB with aspiration channel MVSH)

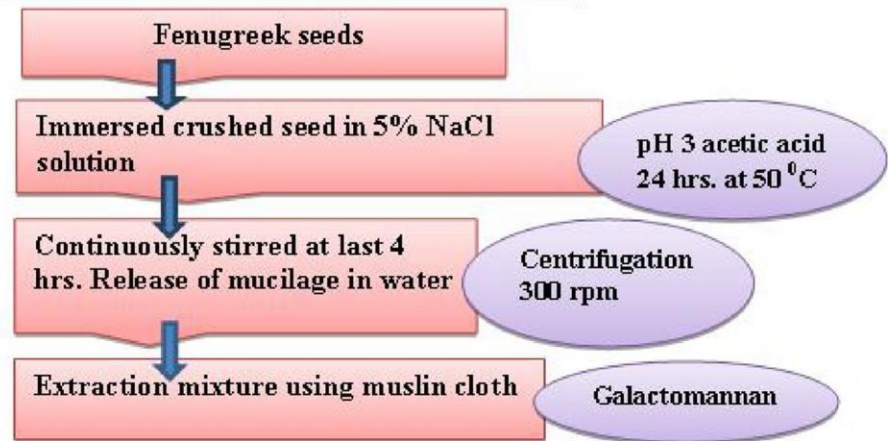


EXTRACTION OF GLACTOMANNAN FROM FENUGREEK SEEDS

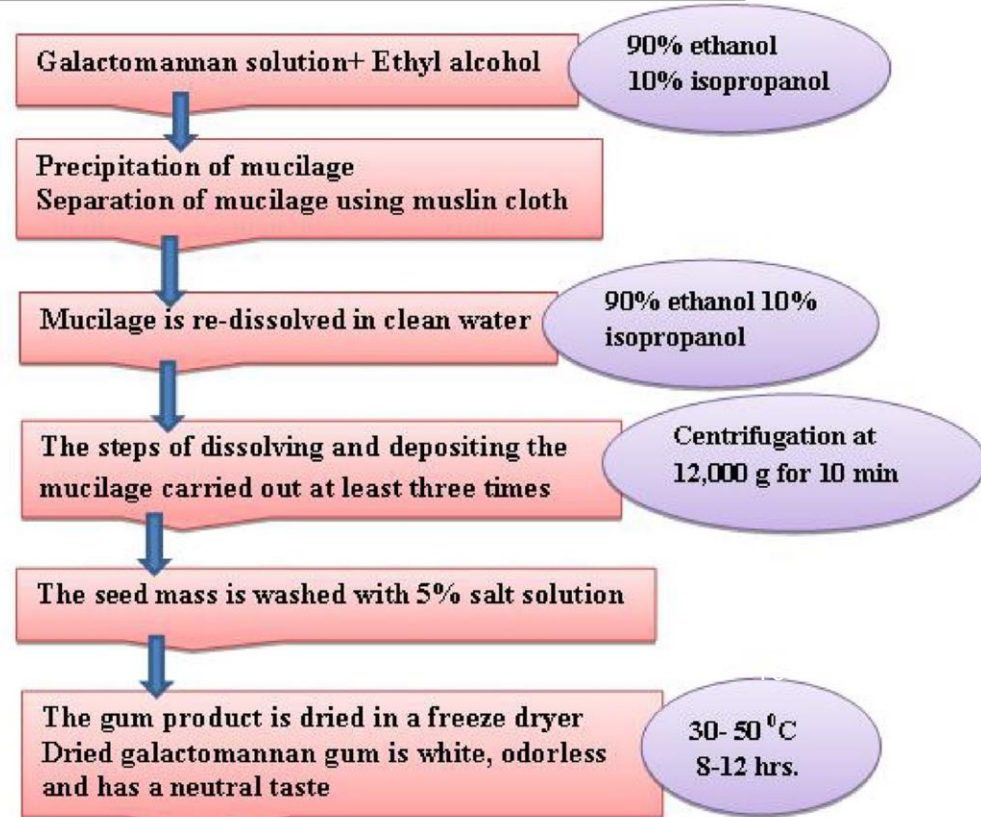
- Galactomannan, a water-soluble heteropolysaccharide was isolated and purified from seed of fenugreek locally called as Kasuri Methi.
- The major bioactive constituents of fenugreek seeds includes 45–60% carbohydrates, most of which is a mucilaginous fiber with a proportion of 30% soluble fiber (galactomannan) and 20% insoluble fiber.

Rashid et al., 2018

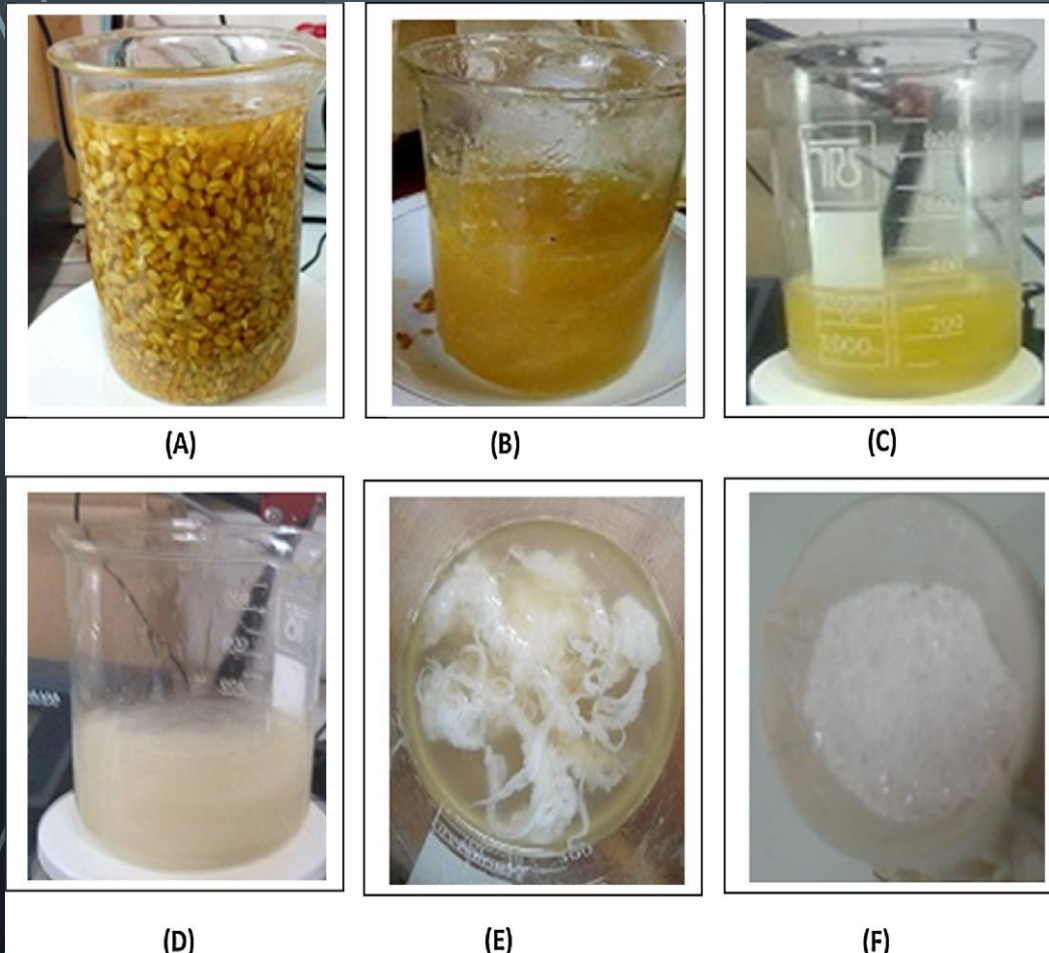
Step 01: Extraction of Glactomannan



Step 2: Isolation and Purification of mucilage



GALACTOMANN EXTRACTION



Pictorial depiction of galactomann extraction procedure

(A) Soaking of seeds in 5% NaCl solution

(B) Filtered crude gum from muslin cloth

(C) Small amount of crude gum from beaker B dissolved in distilled water

(D) Precipitation with IPA-spirit

(E) Clear presentation of Galactomann thread in Petri Dish (F) Filtration of gum with

muslin cloth

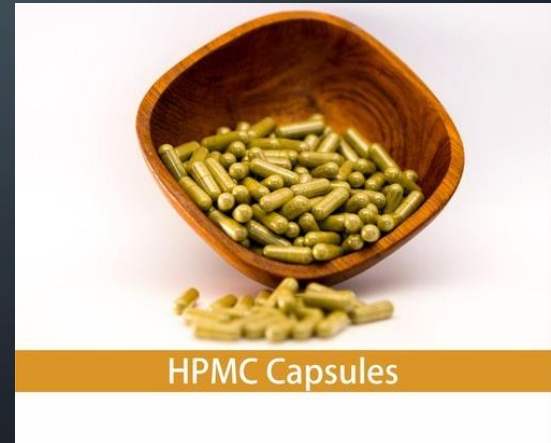
GRADES OF FENUGREEK GUM

Types	Galactomannan content	Features	Applications
Gum A	86%	White or slight yellowish powder with a slight original smell.	Viscous Agent
Gum B	80-86%	Light yellowish powder with a slight original smell.	Viscous Agent
Gum C	60-80%	Light brownish powder with a slight curry smell	Health supplements, tablets and capsules

FENUGREEK EXTRACT (GALACTOMANNAN) CAPSULE, POWDER



FENUGREEK EXTRACT POWDER



HPMC Capsules

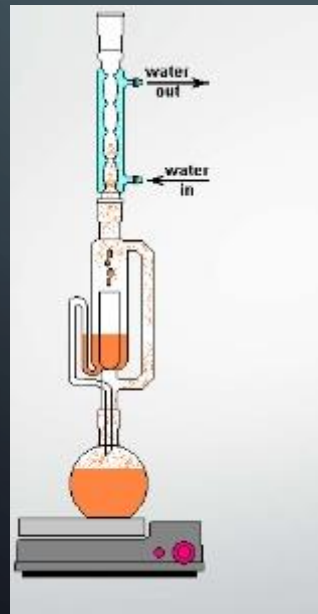
METHODS OF FENUGREEK SEED OIL EXTRACTION

Fenugreek seed

Hydro distillation

Solvent extraction

Cold pressing



Fenugreek seed

Hydro distillation

Soaking of seeds/powder

Heating

Volatile material away by steam

Condensation

Separation

Collection of oil

Packaging of oil

Solvent extraction

Grinding of seed

Addition of solvent (ethanol or hexane)

Heating of solvent (6-12 hr) at 60-70 °C

Volatile oil diffused into solvent

Evaporation of solvent

Collection of oil

Packaging of oil

Cold pressing

Size reduction

Passing through expeller

Filtration of oil

Collection of oil

Packaging of oil

APPLICATIONS

S.No.	Application	Functions	Usage level (%)
1	Baked goods and breads	Provides texture , retains moisture	0.15-0.45
2	Gravies and soups	Adds viscosity and suspension	0.20-0.50
3	Dressing , sauces , dips	Adds viscosity , suspension and stabilizers emulsions	0.20-0.50
4	Nutritional Beverages	Adds mouthfeel, viscosity and suspension	0.10-0.25
5	Frozen products	Increases freeze/thaw stability	0.05-0.45
6	Nutritional bars	Retains moisture	0.05-0.25
7	Meal replacement systems	Adds texture	0.05-0.50

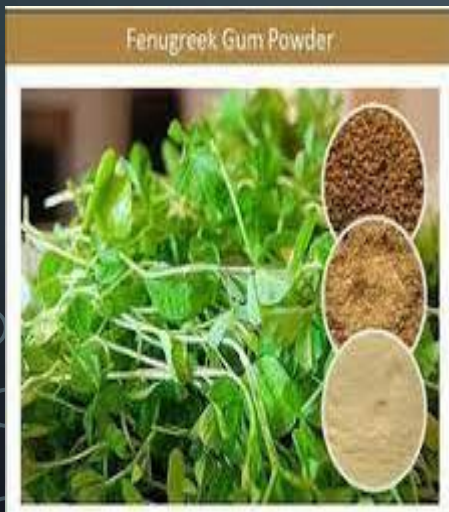
USES OF FENUGREEK

- Fresh seed can be sprouted to give tasty sprouts.
- The seeds can be lightly roasted and ground and used as flavouring, especially in curry dishes.
- The young leaves are often used in Asian dishes and can be included in salad mixes.
- Traditionally, fenugreek tea made from the crushed seed was used medicinally for a range of ailments.
- The plant was fed to animals as a both a tonic and a valuable food source; however it is now thought to have deleterious effects on animals if eaten in excess.

USES OF FENUGREEK SEED

FENUGREEK GALACTOMANNAN

Various industrial applications.



SAPONINS (DIOSGENIN)

Flavoring, sweetening, antioxidant, foaming, complexing, sequestration, anticarcinogenic and antimicrobial property That's why they are used as nutraceutical in food, drug, health food and cosmetic industry

FENUGREEK OLEORESINS

Used as an ingredient for imitation maple flavors and is effective in butter, butterscotch, black walnut, nut and spice flavors



PHARMACOLOGICAL BENEFITS OF FENUGREEK SEEDS

- Hypocholesterolemic
- Antilipidemia
- Antioxidant
- Hepatoprotective
- Anti-inflammatory
- Antibacterial
- Antifungal
- Antiulcer
- Antilithigenic
- Anticarcinogenic



BENEFITS OF FENUGREEK

- It is cheap and easily available.
- Can be consumed in many forms - Fenugreek tea made from the seeds is used as a gargle in sore throats and for fevers.
- The drink is mucilaginous, nutritious, and soothing to the intestinal canal.
- The seeds are rich in dietary fiber, which may be the main reason it can lower blood sugar levels in diabetes.
- Fenugreek is useful for atherosclerosis, constipation, diabetes, high cholesterol and hypertriglyceridemia.
- It can be employed as a substitute for cod-liver oil in scrofula, rickets, anemia, debility following infectious diseases.

FSSAI REGULATIONS FOR FENUGREEK SEEDS

- Fenugreek (Methi) Whole means the dried mature seeds of *Trigonella foenum graecum* L. The seeds shall be free from any off flavour, mustiness and rancidity. It shall be free from mould, living and dead insects, insect fragments, rodent contamination. The product shall be free from added colour, and other harmful substances.
- It shall conform to the following standards:-

It shall conform to the following standards:-

(i)	Extraneous matter	Not more than 2.0 percent by weight
(ii)	Moisture	Not more than 10.0 percent by weight
(iii)	Total ash on dry basis	Not more than 5.0 percent by weight
(iv)	Ash insoluble in dilute HCL on dry basis	Not more than 1.5 percent by weight
(v)	Cold water soluble extract on dry basis	Not less than 30.0 percent by weight
(vii)	Edible seeds other than fenugreek	Not more than 2.0 percent by weight
(viii)	Insect damaged matter	Not more than 1.0 percent by weight

FSSAI REGULATIONS FOR FENUGREEK POWDER

- Fenugreek (Methi) powder means the powder obtained by grinding the dried mature seeds of *Trigonella foenum graecum* L. It shall be free from mould, living and dead insects, insect fragments, rodent contamination. The powder shall be free from added colour and other harmful substances
- It shall conform to the following standards:-

(i)	Moisture	Not more than 10.0 percent by weight
(ii)	Total ash on dry basis	Not more than 5.0 percent by weight
(iii)	Ash insoluble in dilute HCL on dry basis.	Not more than 1.5 percent by weight
(iv)	Cold water soluble extract on dry basis	Not less than 30.0 percent by weight

FSSAI MICROBIOLOGICAL PARAMETER FOR FENUGREEK SPICE


S.No.	Requirements	Load
1	Total Plate Count	-
2	Coliform Count	-
3	E. Coli	-
4	Salmonella	Absent in 25 gm
5	Shigella	-
6	Staphylococcus aureus	-
7	Yeast and Mould Count	-
8	Anaerobic Spore Count	-
9	Listeria monocytogen	-



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