

# FENNEL PROCESSING



**AATMANIRBHAR BHARAT**

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

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- Fennel Market in terms of production, consumption, covers Indian States of Gujarat, Rajasthan, Uttar Pradesh, Haryana, West Bengal.
- Common name: Saunf, Bitter Fennel, Florence Fennel and Sweet Fennel
- It is widely used in food industry and has aromatic and medicinal use as well.
- Indian market is projected to display a robust growth represented by a CAGR of 5.78% during 2012 – 2022
- Amongst the leading export countries, U.S.A. accounts for the largest share of export in the Indian Fennel market
- Key factors driving the robust growth rate of North America region include rising healthcare expenditure, rising consumption of packaged and organic food and beverages, etc.

- Fennel essential oil is best known as a powerful ingredient for good digestive health.
- Like its root plant, it has a licorice-like flavor and an aroma that's developed from crushing the seeds of the fennel plant and going through a process of steam distillation.
- It provides phenomenal digestive support and can help you to find balance in your diet.
- Fennel is an antiseptic, can help reduce and possibly eliminate gut spasms, helps prevent gas and bloating, has purifying and detoxifying effects
- It is an expectorant, can help increase the flow of breast milk, and is a natural laxative and even a mouth freshener
- Aids in Weight Loss

# RAW MATERIAL

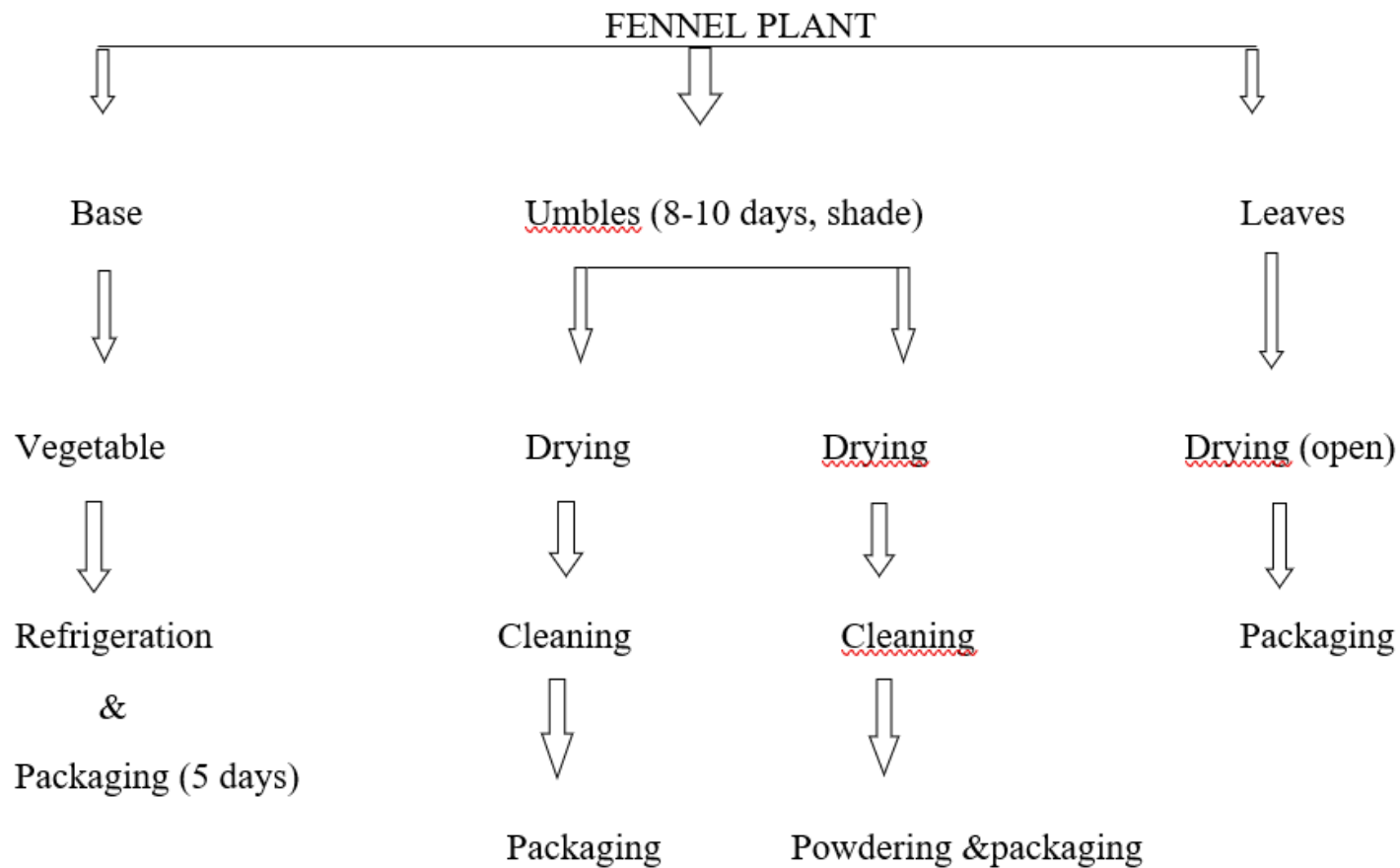
- Fennel also called saunf is one of the popular seed spices in India mainly grown in Rabi season.
- Fennel originally belongs to Southern Europe and Mediterranean region and is cultivated mainly in the temperate and subtropical regions of the world.
- Gujarat Rajasthan, Karnataka, Maharashtra, U.P., Punjab and Bihar, Gujarat and Rajasthan are the major fennel producing Indian states being cultivated in Rabi season
- The fennel plant is a perennial herb with yellow flowers and feathery leaves.
- Fennel crop is ready to harvest after 170-180 days. The harvesting is done by plucking when the crop is matured but still green.

## VARIETIES OF FENNEL

Variety	Specifications	Yield (Quintals/ha)
<b>Gujarat Fennel1</b>	Medium-bold and dark green seeds	16.9
<b>Ajmer fennel 1</b>	Bold, medium sized, fragrant seeds	19 to 25
<b>RF-125</b>	Long, and bold grains	17
<b>RF-101</b>	Long, and bold grains	14
<b>Hisar Swarup</b>	Long, and bold grains	16
<b>PF-35</b>	Medium-sized, hairless and green seeds.	13

# PROCESSING AND MACHINERY

## FENNEL SEED PROCESSING FLOW CHART



# FENNEL SEEDS PROCESSING STEPS



Harvesting crop  
(180 days after  
sowing)



The matured seeds  
are dried under sun



Cleaning



Cleaning with  
centrifugal blower



Grading the seeds  
according to their  
size.



packed and stored  
in damp free  
environment.



## FENNEL SEEDS PROCESSING STEPS Conti...

- **Feeding hopper:** The feeding of seed to the cleaning unit is done by the feed hoppers. The purpose of hopper is to provide continuous supply of mixture of seeds and impurities to the cleaning unit.
- **Sieving:** The mixture of seed and impurities then go to the sieving unit which generally consists of 2 sieves. The upper sieve is for the separation of bolder and coarser materials and the lower sieve is for relatively small impurities. The lower sieve is further subdivided into multiple sections which allow different sizes of seeds to pass through them. The lower sieve thus also acts as a grading unit.
- **Centrifugal blower:** The lighter impurities are removed by the blower. It sucks the air out of the cleaning unit and thus sucks out lighter impurities. The centrifugal blower is operated by electric motor.

# NUTRITIVE VALUE OF FENNEL

Sr. No.	Composition	Content
1	Moisture	6.3 g
2	Protein	9.5 g
3	Fat	10.0 g
4	Carbohydrate	42.3 g
5	Crude fiber	18.5 g
6	Mineral matters	13.4 g
7	Calcium	1.3 g
8	Phosphorus	0.48 g
9	Iron	0.01 g
10	Sodium	0.09 g
11	Potassium	1.7 g
12	Vitamin A	1040 I.U.
13	Vitamin B-1	0.41 mg
14	Vitamin B-2	0.36 mg
15	Niacin	6.00 mg
16	Vitamin C	12.00 mg
17	Food energy	370 Calories

# QUALITATIVE ASSESSMENTS OF THE FINISHED PRODUCTS

According to the FSSAI's Food Products Standards & Food Additives regulations, 2011 following are the standards which are to be adhered to for fennel processing.

1. Fennel (Saunf) It shall have characteristic flavour free from foreign odour, mustiness and rancidity.
2. It shall be free from mould, living and dead insects, insect fragments, rodent contamination.
3. The product shall be free from added colouring matter and any harmful substance.
4. It shall conform to the following standards

## QUALITATIVE ASSESSMENTS OF THE FINISHED PRODUCTS

Quality Parameters	Remarks
<b>Extraneous matter</b>	Not more than 2.0 percent by weight
<b>Defective seeds</b>	Not more than 5.0 percent by weight
<b>Moisture</b>	Not more than 12.0 percent by weight
<b>Total ash on dry basis</b>	Not more than 10.0 percent by weight
<b>Ash insoluble in dilute HCl on dry basis</b>	Not more than 2.0 percent by weight
<b>Volatile oil content on dry basis</b>	Not less than 1.0 percent by v/w
<b>Edible seeds other than fennel</b>	Absent
<b>Insect damaged matter</b>	Not more than 1.0 percent by weight

# SUGAR COATED FENNEL SEEDS



Make sugar syrup. It is added to sugar coating machine



Fennel seeds are added to the sugar-coating machine



Different food colours can be added to give colour to the fennel seeds

## FENNEL ESSENTIAL OIL EXTRACTION

- Fennel oil is produced by distillation of fennel seed.
- It is very useful in pharmaceutical industry as a cough medicine, antiseptic, and laxative and as an additive substance in various types of cuisine, bakery, confectionery, pharmaceuticals, and cosmetics.
- The main component of fennel oil is anethole and anise oil. Fennel oil contains 50-60% anethole, while anise oil contains for about 80-90% anethole.
- The fennel oil quality is determined by the amount of anethole content.
- The fennel oil has a better quality if it has higher content of anethole

## FENNEL ESSENTIAL OIL EXTRACTION

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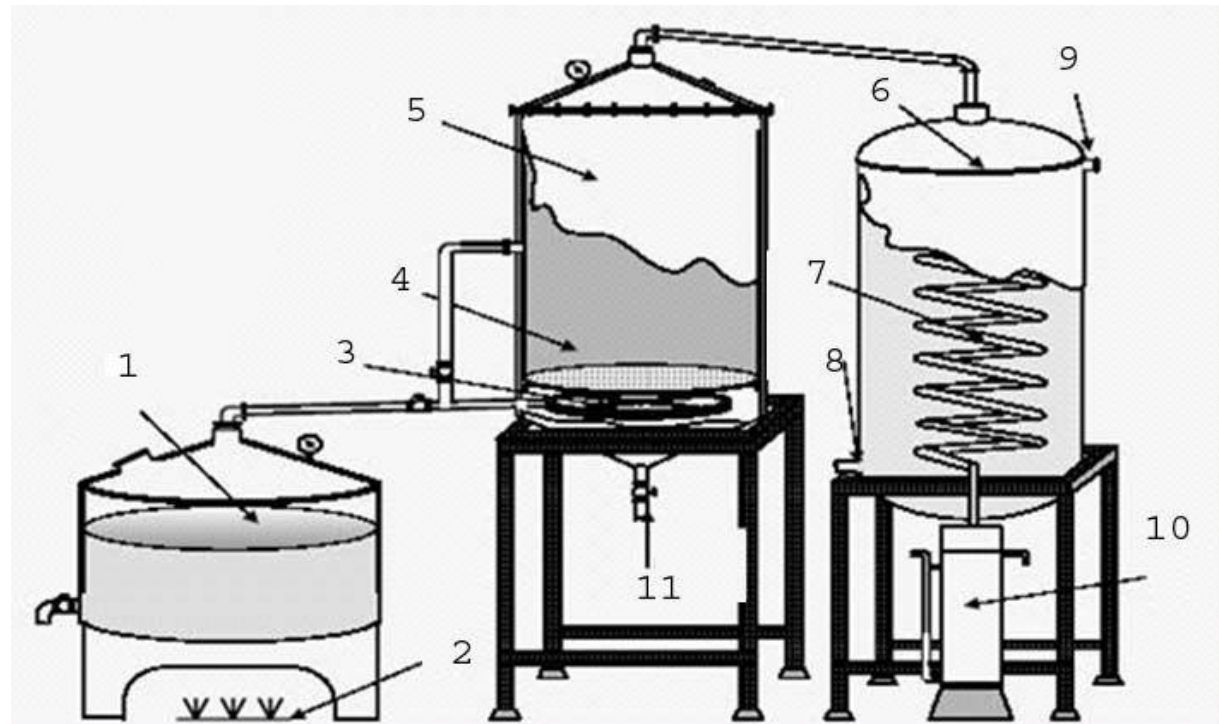
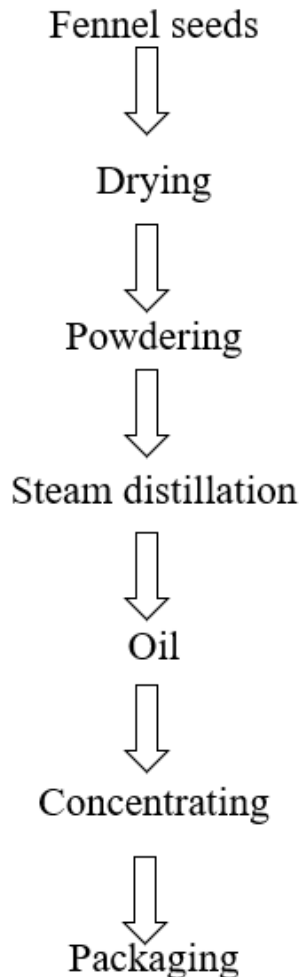
### The recovery process of essential oil

- supercritical extraction
- Pressing, extraction with solvent extraction.
- Extraction with fat.
- and distillation (distillation).

The steam distillation process (direct) is a steam distillation using steam. It flows through a circular pipe which is located below the porous material and the vapor moves upward through the material that is located on the top sieve.

# FENNEL ESSENTIAL OIL EXTRACTION

Conti...



1. Boiler, 2. Fire, 3. Steam distributor, 4. Boiler materials with a perforated sieve, 5. Distillation kettle, 6. Condenser, 7. Coil, 8. Water in, 9. Water out, 10. Separator tank.



## PHYSICO-CHEMICAL PROPERTIES OF FENNEL OIL

Properties	Value
Colour	Clear, pale yellow
Specific gravity, at 25 ° C	0.978 to 0.988
Optical rotation	(-2) -10
Refractive index at 25 ° C	1.55
Solubility in alcohol 90%	perfectly soluble 1:3

## FENNEL POWDER

- Fennel powder is used in many food items such as bakery items and Ayurvedic/Unani medicine.
- The fennel powder should be devoid of any foreign odour, mouldiness and rancidity.
- There should be no presence of mould, insects in dead or live form, rodent contamination.
- It should also be free of added colours and any harmful substance.
- The fennel powder should have conformity with the following standards

## FENNEL OLEORESIN

- The major constituent of Fennel Oleoresin are volatile oil,  $\alpha$ -pinene and myrcene
- Fennel oleoresin is known for its antiseptic, expectorant, Carminative, laxative, diuretic, stimulant and stomach qualities.
- It is widely used in food processing industries as spice

### Quality requirements

Botanical name	Active component	Volatile Oil Content (VOC in ml/100g of oleoresin) (Not less than)
Foeniculumvulgare Mill.	Anethole	3.0

## QUALITY ANALYSIS

As per the required standards specified by FSSAI for fennel seeds, the following characteristics should be analysed:

Characteristics	Method of Test
Moisture content	9 of IS 1797
Total ash	7 of IS 1797
Acid insoluble ash	8 of IS 1797
Volatile oil	15 of IS 1797
Salmonella	IS 5887 (Part 3)
Edible seeds other than fennel	Physical separation and weighing
Insect damaged seeds	Physical separation and weighing
Extraneous matter	4 of IS 1797
Defective seeds	Physical separation and weighing

# QUALITY ANALYSIS

Conti...

## Extraneous matter (for seeds)

- 100 to 200g of thoroughly mixed sample is taken and any foreign materials are separated from the fennel seeds.
- Transfer the materials on a tarred watch glass and weigh it.
- The watch glass should also be weighed separately.
- The difference between these two weights gives the amount of extraneous matter.
- It is the divided by total weight to get the proportion of extraneous matter in the sample which when multiplied by 100 gives the percentage.

## QUALITY ANALYSIS

Conti...

### Preparation of sample for chemical analysis

- The sample is ground to make it pass through IS Sieve of size 1mm.
- The sample after grinding is transferred to an already dried container and should be immediately closed.

### Total Ash

- The portion obtained after complete combustion of the sample.
- It indicates the amount of essential minerals (acid soluble) and acid insoluble portion (sand and silica).

## QUALITY ANALYSIS

Conti...

### **Acid insoluble ash**

It represents the amount of sand and silica in the sample that is insoluble in acid.

### **Moisture content**

The water content of the sample is analysed by distilling it by an organic liquid, followed by the collection of the distillate.

### **Volatile oil**

Clevenger-type with joints is used for determining volatile oil

# QUALITY ANALYSIS

Conti...

## Salmonella

Selective enrichment-based test as specified by IS 5887 (Part Microbiological criteria)

The microbiological criteria of fennel seed as per FSSAI (Food Products Standards and Food Additives) Regulations, 2011

Requirements	Specifications
Salmonella	Absent in 25 gm.





For More details Contact:

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