Ministry of Food Processing Industries
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Micro Food Processing Enterprises Scheme

HANDBOOK OF PROCESSING OF DAL

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CONTENTS

No	Chapter	Section	Page No
1	**Introduction**		**4-10**
1.1		Industrial Overview	4-7
1.2		Product Description	7
1.3		Market Potential	7-8
1.4		Raw Material	8-9
1.5		Types of Raw Material	9-10
2	**Process & Machinery Requirement**		**11-19**
2.1		Raw Material Composition	11
2.2		Source of Raw Material	11-12
2.3		Technologies	12-13
2.4		Manufacturing Process	13-15
2.5		Flow Chart with Machines	15-16
2.6		Additional Machine & Equipment	16-17
2.7		General Failures& Remedies	17-18
2.8		Nutritional Information of Product	18
2.9		Export Potential & Sales Aspect	19
3	**Packaging**		**19-23**
3.1		Shelf Life of Product	19-20
3.2		Dal Packaging	20-21
3.3		Types of Packaging	21
3.4		Material of Packaging	22-23
4	**Food Safety & FSSAI Standards**		**23-30**
4.1		Introduction to FSSAI	23
4.2		FSSAI Registration & Licensing Process	24-25
4.3		Food Safety & FSSAI Standards & Regulations	26-28
4.4		Labelling	29-30
5	**Opportunities for Micro/Unorganized Enterprises**	**PM FME Scheme**	**31**

ABBREVIATIONS & ACRONYMS

Sl: No.	Abbreviations &Acronyms	Full Forms
1.	CAGR	Compound Annual Growth Rate
2.	DV	Daily Value
3.	FAO	Food and Agriculture Organization
4.	FBO	Food Business Operator
5.	FLRS	Food Licensing and Registration System
6.	FPOs	Farmer Producer Organizations
7.	FSS	Food Safety and Standards
8.	FSSAI	Food Safety and Standards Authority of India
9.	FoSCos	Food Safety Compliance System
10.	HDPE	High-density polyethylene
11.	Kcal	Kilocalorie
12.	MoFPI	Ministry of Food Processing Industries
13.	LDPE	Low-density polyethylene
14.	PA	Polyamide
15.	PET	Polyesters
16.	PFA	Prevention of Food Adulteration
17.	PVDC	Polyvinylidene chloride
18.	PVC	Poly Vinyl Chloride
19.	PP	Polypropylene
20.	RF	Refined Wheat Meal
21.	SHGs	Self Help Groups
22.	UAE	United Arab Emirates
23.	UK	United Kingdom
24.	US	United States
25.	WGWF	Whole Grain Wheat Flour
26.	WVTR	Water Vapour Transmission Rate

CHAPTER- 1
INTRODUCTION

1.1. Industrial Overview:

Pulses are a staple of any vegetarian's diet, yet they're also popular among non-vegetarians. They are the primary protein sources. Pulses are used in a variety of recipes, including hot foods, sweet dishes, and others. Pulses are the most prevalent food in Indian households. The most desirable type of dal to be cooked for families is cleanly removing the peels and splitting the pulse grains into facts two pieces.

Dal is a dry cereal that is consumed to provide the protein needs of a normal human being. The interior portion of the dal is high in protein and vitamins, and it provides the necessary nutrition after cooking. Pulses are blended into other cereal foods to boost the quality of proteins delivered into the body due to their high protein content. The usage of pulses as food is concentrated in developing countries, which consume about 90% of the world's food pulses. In low-income countries, pulses contribute about 10 percent of the daily proteins and about 5 percent of energy requirements in human diets. Per capita consumption of pulses is also high among vegetarians, as a source of protein, and a high percentage of people in India are vegetarians. The important part of pulses play as a source of dietary protein, energy, minerals, and vitamins for the predominantly vegetarian population of India, needs no reiteration, and nutritionists regard pulses as an essential means to correct malnutrition. Pulses provide roughly 10% of daily protein and 5% of daily energy requirements in

developing country's diets. Vegetarians consume a lot of pulses as a source of protein, and vegetarians make up a large portion of the population in India. Pulses importance as a source of nutritional protein, energy, minerals, and vitamins for India's primarily vegetarian population is self-evident, and nutritionists see pulses as a critical component in the treatment of malnutrition. India has the distinction of being the world's largest producer of grain legumes (Pulses) even if the production is not adequate to ensure a per capita availability of 80 grams per day, which is the minimum recommended by the World Health Organization. Pulses are the chief source of protein for the majority of the population. There are over 1000 units at present engaged in processing various pulses in different parts of the country. The pulse milling industry is predominantly a small-scale industry and has been reserved for exclusive development in the small-scale sector. There is good domestic as well as export demand of Dal/pulse. New entrepreneurs who venture into this field will be successful.

India is the world's largest producer of legumes (Pulses), despite the fact that output is insufficient to meet an annual per capita availability of 80 grams, as recommended by the World Health Organization and the Food and Agriculture Organization of India. In different parts of the country, over 1000 small and medium industries are now processing pulses. Pulse milling is mostly a small-scale industry that has been set aside for development in the small-scale sector. Dal/pulse is in high demand both domestically and internationally.

1.1.1. Varieties of Pulses and their protein content

Image	**Name**	**Protein (%)**	**Nutritional important**
	Bengal Gram (Desi Chick Pea / Desi Chana),	21	• Vitamin and mineral content is abundant. • Rich source of fibre helps in the improvement of digestion. • Helps to lose weight. • Protein-rich foods and can serve as a meat substitute. • Reduces the risk of several diseases • Low-calorie density

			• manage blood sugar level
	Pigeon Peas (Arhar / Toor / Red Gram),	22	• Carbohydrates are rich. • Is it an excellent protein source • Contains a lot of fiber • Iron and calcium-rich • Has the potential to reduce the risk of heart disease. • It helps with digestion.
	Green Beans (Moong Beans),	24	• Vitamins and minerals abound. • Essential amino acids are abundant in this food. • One of the greatest plant-based protein sources • Has a high quantity of antioxidants • Mung beans that have been sprouted have extremely few calories. • Can help to avoid heatstroke. • Lowers cholesterol levels. • Can help to lower blood pressure and blood sugar levels. It helps with digestion.
	Black Matpe (Urad / Mah / Black Gram),	25	• Vitamin B is abundant in urad dal. • Protein, fats, and carbohydrates are all abundant in this dish. • Iron, calcium, magnesium, and potassium are all abundant in this food. • Fiber-rich • good for pregnant women. • Enhances digestion • It is healthy food for the heart. Improves blood circulation and

			prevents atherosclerosis.
	Lentils (Masoor).	9	• Masoor contains a fair amount of dietary fiber • It has a low glycemic index, making it a good blood sugar regulator. • Food that is suitable for diabetics. • maintain the cholesterol • Helps aid weight loss • Boosts the immune system • Reduces the risk of cell damage • Type of anti-aging food, Rich in calcium and magnesium

1.2. Product Description:

Pulses are one of the important food crops globally due to their higher protein content. Pulses are a significant crop community in India. Pulses are one of the most important protein sources in the diet. Pulses are an essential part of the Indian diet for people of all ages, adding much-needed protein to a carbohydrate-rich diet. Major pulses grown and consumed in India are include Bengal Gram (Desi Chick Pea / Desi Chana), Pigeon Peas (Arhar / Toor / Red Gram), Green Beans (Moong Beans), Chick Peas (Kabuli Chana), Black Matpe (Urad / Mah / Black Gram), Red Kidney Beans (Rajma), Black Eyed Peas (Lobiya), Lentils (Masoor). Pulses are one of the most popular staple foods in South Asian countries, and they play an important role in Indian subcontinent cuisines. Pulses' nitrogen-fixing properties contribute to safe soils and climate change mitigation.

1.3. Market Potential:

Pulses are the most common diet part of Indian families. Dal is a dry cereal that is consumed to meet the protein needs of an average human being. Pulses are incorporated into other cereal foods to improve the quality of proteins inserted into the body due to their high protein content. In 2019, the Indian pulses market reached a volume of 27.5 million tonnes. The markets for pulses/dal are largely concentrated in India, where 90% of the product is consumed locally. Pulses are being used more and more in the manufacturing of ready-to-eat

(RTE) foods. Healthy snack foods are becoming more common among the working population as a result of rapid urbanization, shifting lifestyles, and hectic work schedules. The demand for pulses will never go away, but it will grow at an ever-increasing pace as the world's population grows. Global Pulse Market size was 115.3 Million Tons in 2019, expected to grow at CAGR of 4.5% from 2020 to 2025. It's projected to reach 143.7 Million Tons by 2025.

Few Indian Major Players are as under dal manufacturing are: Edible Products (India) Ltd., Rajhans Foods Ltd. Ruchi Global Ltd., Poona Roller Flour Mills Ltd., Transglobe Foods Ltd., Bafna Agro Ind. Ltd., Eastern Overseas Ltd., Prime Impex Ltd., Ajeet Seeds Ltd. B G H Exim Ltd., Bhura Exports Ltd., Green Gold Seeds Ltd., K R B L Ltd., Kumar Food Inds. Ltd., M K International Ltd. Nath Seeds Ltd. Navjivan Roller Flour & Pulse Mills Pvt. Ltd.

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1.4. Raw Material Description:

Pulses include green gram, red gram, Bengal gram, horse gram, cluster bean, field bean, and cowpea. In general, their protein content is high, often more than twice that of cereal grains, and they make up about 20% of the dry weight of seeds. The protein content of some legumes like soybean is as high as 40 percent.

Other nutritionally significant compounds, such as vitamins and minerals, are also found in pulse seeds.

- Carbohydrates: Food pulses contain roughly 55-60% of total carbohydrates, which includes starch, soluble sugars, fiber, and carbohydrates that are unavailable.
- Minerals: Pulses are high in calcium, magnesium, zinc, iron, potassium, and phosphorus, among other minerals.
- Vitamins: Carotene, a provitamin A, is found in modest levels in pulses.

1.5. Types of Raw Material (Masoor dal mill)

- Masoor whole seeds
- Packaging Material

Following varieties of Masoor are generally recommended by Indian institute of Pulses research, Kanpur in the different state:

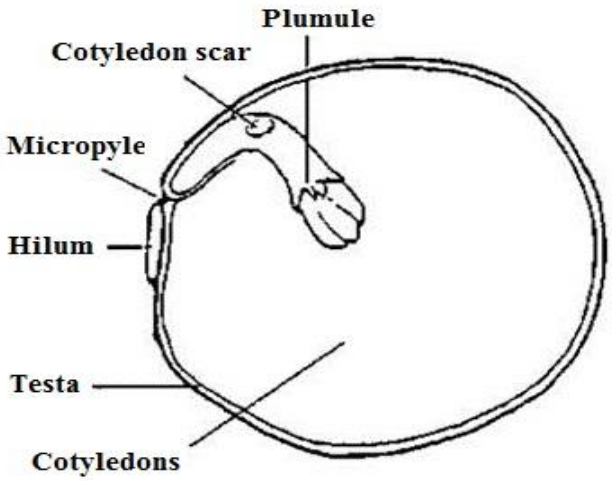
S.No.	States	Recommended Varieties
1.	Bihar	Pant L 406, PL 639, Mallika (K-75), NDL 2, WBL 58, HUL57, WBL 77, Arun (PL 777-12)
2.	M. P. & C.G.	Malika (K-75), IPL-81 (Nuri), JL-3, IPL-406, L-4076, IPL316, DPL 62 (Sheri)
3.	Gujarat	Malika (K-75), IPL-81 (Nuri), L-4076, JL-3
4.	Haryana	Pant L-639, Pant L-4, DPL-15 (Priya), Sapna, L-4147, DPL-62
5.	Maharashtra	JL 3, IPL 81 (Nuri), Pant L 4
6.	Punjab	PL-639, LL-147, LH-84-8, L-4147, IPL-406, LL-931, PL 7
7.	Uttar Pradesh	PL-639, Malika (K-75), NDL-2, DPL-62, IPL-81, IPL-316, L4076, HUL-57, DPL 15
8.	Rajasthan	IPL 406 (Anguri), Pant L-8 (PL-063), DPL-62 (Sheri)

9.	Uttarakhand	VL-103, PL-5, VL-507, PL-6, VL-129, VL-514, VL-133
10.	Jammu & Kashmir	VL 507, HUL 57, Pant L 406, Pant L 639, VL 125, VL 125

Source: Seednet GOI, Min. of Agri. & FW, & ICAR-IIPR, Kanpur[i]

CHAPTER - 2
PROCESS & MACHINERY REQUIREMENT

2.1. Raw Material Aspects:



A legume is a plant or a fruit that belongs to the Fabaceae (or Leguminosae) family. A legume fruit is a dry, basic fruit that originates from a simple carpel and dehisces (opens along a seam) on two sides. This sort of fruit is commonly known as a pod. Peas, beans, lentils, black gram, green gram, soy, and groundnut are few examples of well-known legumes. Pulses have a similar structure, but the seed coat colour, shape, size, and thickness vary. The seed coat, cotyledons, and embryo are the three major components of mature seeds.

The seed coat, also known as the hull, makes up 7-15 percent of the total seed mass. The embryo makes up the remaining 1-4 percent of the seed mass, whereas cotyledons make up roughly 85 percent. The testa (seed coat), hilum, micropyle, and raphe are the seed's exterior structures. The testa is the seed's outermost layer, covering nearly the seed's entire surface. On the seed coat, the hilum is an oval scar where the seed adhered to the stalk. The micropyle, located adjacent to the hilum, is a small aperture in the seed coat. The raphe is a ridge that runs parallel to the micropyle on the side of the hilum.

The embryonic structure remains after the seed coat has been removed from the grain. Two cotyledons (or seed leaves) with a short axis above and below make up the embryonic structure. Except for the axis and a faint layer of protection given by the seed coat, the two cotyledons are not physically connected. As a result, the seed is particularly prone to breaking.

2.2.Source of Raw Material

India is the world's largest producer of pulses (25 percent of global production), the consumer (27 percent of global consumption), and the importer (14 percent). Pulses cover around 20% of the land planted to foodgrains and generate about 7% to 10% of the country's overall

foodgrain production. Despite the fact that pulses are grown in both the Kharif and Rabi seasons, Rabi pulses account for more than 60% of overall production.

Gram is the most important pulse, accounting for roughly 40% of total production, followed by Tur/Arhar (15–20%), Urad/Black Matpe (8–10%), and Moong (8–10%). The top five pulse-producing states are Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, and Karnataka. average Pulse productivity is 764 kg/ha in India.

2.3. Technologies:

Saddle stones

It is the method of spilling dal the processes similar to flour making. Traditionally, this would have been done by grinding the pulses between two stones, a lower, stationary stone called the quern stone, and an upper, mobile stone called the hand stone.

It's a scaled-down version of the chakki that may be carried around the house. It's known as chakula, and it's used to separate the whole pulse into dal and rice. Daliya made from a variety of grains

Because the stones were smaller in diameter, the grain was just broken and not ground into flour.

Mini Dal mill:

It is an ideal unit for small-scale industries because it allows the producer to process the products in the village and obtain a larger yield of high-quality dhal through a cost-effective and simple operation. The tiny dhal mill dehusks conditioned pulses and is powered by a single-phase 1 hp motor. It produces 77-80% dhal and has a dehusking efficiency of 97-99%. (Fig. 3). After pre-milling treatment, a particularly constructed grader is used to separate a huge quantity of pulse. This grader has a 100-150 kg wet pulse/hr capability and is powered by a 0.5 hp

single-phase electric motor. This mill can readily dehusk strong pulses like tur, Bengal gram, field bean, and others.

Modern method

Many of the operations in commercial milling methods are automated, especially husking and splitting. Whole grains with more easily detachable husks, such as chickpeas, lentils, peas, Lathyrus sativus, and others, require less sun drying and less oil or water treatments. Hard-to-mill grains are sometimes given an initial "pitting" in the roller mill to fracture the husk and increase oil or water absorption. The pitting improves the hulling efficiency of the machine after proper oil/water treatment. In the case of black gram, the wax and dust layer is removed first in a roller mill, allowing for simple water or oil absorption. Husking and splitting can be done as a single operation or as separate operations, which is more efficient.

Moisture addition adversely affects husking, but it helps to split the grain. The addition of water prior to husking helps to induce simultaneous splitting, but this often leaves patches of husk on the split cotyledons (dhal) that have to be removed by scouring in polishing machines. In commercial milling material handling equipment like elevators, conveyors, etc are used for easy operation in some of the mills.

2.4.Manufacturing Process:

Manufacturing Process

The following steps are given below for Masoor dal processing:

- Destoner simply removes stones from Masoor.
- The stone fall of in a separate tank while Masoor fall into a silo
- From silo they are feed uniformly to various Emery Roll Dehusker
- They simply utilize their respective emery roller set to remove husk
- Whole Masoor along with removed husk is elevated to a higher level
- Where it’s feed to another silo which, supplies it to Classifier Separator
- It simply remove any impurities like leaves, sand, other lighter grains
- Thus cleaned whole Masoor dal is obtained

- This whole Masoor is now feed to a Lentil Splitting Machine
- It simply splits the whole Masoor into two pieces
- Two halves falls in a silo; from where they are feed to Pulse grader
- It simply utilizes its vibration & grading trays to separate Masoor dal
- Separating good dal from slightly broken & completely broken dal
- All these sorted components fall in separate silos
- While dirt is collected in a separate bin
- Each silo having their own feeder arrangement
- Feeder of these silos are opened after placing a sack in its open end
- So as to fill the sack with Masoor dal
- These sacks are then stitched utilizing a sack stitching machine
- They are weighed to verify weight content & are then sent for sale

2.5. Flow Chart:

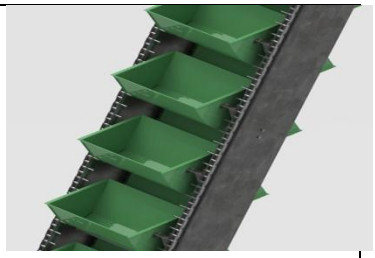
Steps	**Machine Name**	**Description**	**Machine Image.**
Grain Delivery	Unloading Bins	These are large bins designed for unloading of grains & similar product; they are equipped with large rod mess to prevent big impurities from entering system.	
Grain Storage	Silos	These Equipments are class of storage Equipments which are specifically designed for dry grain raw material of small granule composition. Usually used to store grains but can also be used to store cement & aggregate.	

Cleaning	**Horizontal Cyclone Separator**	This machine is used to separate particulate matter within an air suspension using their weight difference. It is used in wide range of plants ranging from thermal power plant to food grain processing plant.	
Dehusking	**Emery Roll Dehusker**	It's a machine which utilizes emery rollers to remove outer skin of pulses. The pulse or grain is simply pressed in-between emery rollers to break otter shell to liberate inner Endosperm.	
Splitting	**Lentil Splitting Machine**	It's a machine designed to split the whole dehusked pulse into two halves, locally called as chakki. Different type of arrangements are available but to achieve this splitting.	
Grading	**Pulse Grader**	It's a machine used to separate pulses into unbroken, partially broken & broken dal. This machine has its own vibrator arrangement, which along with appropriate sieve or grader sheet can be effectively used for grading.	

Filling and stitching	**Filling and stitching Machine**	The Automatic Weighing and Packing Machine support the process of precise weighing and packaging of animal feed pellets. The machine weighs the product with accurate measures and fills these in gunny bags.	

2.6. Additional Machine & Equipment:

Name	Description	Machine Image.
De-stoner	It's a machine designed to remove stones from the given product, which in this case are pulses. Widely used in different food grain processing plants to remove stone like impurities.	
Classifier Separator	It's a machine which is used to separate whole dehusked pulse from husk. Aspirator type machines utilize compressed air for cleaning purpose.	
Magnetic Separator	It's a type of separator which is used to magnetic impurities from given product using powerful electromagnets, used in wide range of industries for separation.	
Screw conveyor	A screw conveyor, also known as an auger conveyor, is a device that moves liquid or granular materials by spinning a helical screw blade called a "flighting" inside a tube.	

Bucket elevators	A bucket elevator, also known as a grain leg, is a device for vertically transporting flowable bulk materials.	
Belt conveyer:	The most popular use for belt conveyors is the transportation of bulk materials (grain, salt, coal, ore, sand, etc.).	

2.7. General Failures & Remedies:

S. No.	General Failures	Remedies
1.	Ball bearing failure of various machine	1. Proper periodic lubrication of all bearings in various machines. 2. Regular replacement of all bearing to prevent critical failures.
2.	Power Drive Overload	1. Ensure proper weighing & metering specially in case of semi-automatic plant. 2. Install warning sensor in buffer region of loading capacity to ensure efficient operation.
3.	Mechanical Key Failure	1. Ensure that mechanical keys are replaced as per there pre-defined operational life. 2. Prevent Overloading.
4.	Loss of Interface	1. This problem is dominant in newly established automatic plant, one must learn to maintain rules in plant & ensure no employee goes near transmission lines, unless authorised. 2. Provide proper physical shielding for the connections.
5.	Hulling	Grain has the whole hull intact.

		Extra cleaning required for pulse milling to sift out the impurities (dirt, chaff, etc.)

2.8. Nutritional Information of Masoor dal (Lentil)

S. No	Nutritional contents	Qty
1.	Protein	24-26%
2.	Carbohydrate	57 – 60%
3.	Fat	1.3%
4.	Fibre	3.2%
5.	Phosphorus	300 mg/100 g
6.	Iron	7 mg /100 g
7.	Vitamin C	10-15 mg/100 g
8.	Calcium	69 mg/100g
9.	Calorific value	343 Kcal/100 g
10.	Vitamin A	450 IU

Source: Seednet GOI, Min. of Agri. & FW, & ICAR-IIPR, Kanpur

2.6.Export Potential & Sales Aspect:

India is the largest producer of pulses in the world, accounting for between 27 and 28 percent of global output. India harvests between 12 and 15 million tonnes of pulses each year. However, for several years, pulse crop yields have remained modest and stable. Pulses are usually grown in drylands throughout the winter. Despite the fact that India produces the most pulses in the world, it imports a significant amount to meet domestic demand. In 2007, India imported 2.79 million tonnes of pulses from a variety of nations, including China, Canada, Australia, and Myanmar. Pulses are a major export from India. The Indian government has made it illegal to export pulses in order to meet expanding domestic demand. As a result, it's critical to evaluate how the influx and outflow of pulses from India have evolved over time; why India imports such a large amount of pulses; and the influence of pulse inflows on the area under cultivation, production quantity, prices, and net food grain availability for consumers.

CHAPTER - 3
PACKAGING

3.1.Shelf Life of Product:

Insect-pest infestation is a common problem that both traders and millers face. Maintaining the consistency of the grain and its product is a difficult task. With due treatment & managed conditioned climate, Dal can be stored without any signs of damage for up to 1 year months. Lentil has a very good shelf life that can extend up to few months. The first thing to know is that it will remain good long past its "best by" or "better if used by" date that can be found on the original container.

Shelf life of Masoor dal depends on following

- Storage Conditions
- Storage –Temperature & Humidity
- Cross Contamination
- Unhygienic Conditions
- Cracks on the floors & walls
- Standing water near the stores
- Spillage & bird faeces in the stores/stairs & floors
- Presence of germs in the dal.

In order to improve the shelf life of the grains Products, the following additional precautions should be taken by millers -:

- ✓ Use clean & fumigated grains for processing.
- ✓ Use scouring machines in the cleaning line.
- ✓ Set cleaning machines with optimum efficiency to separate out all the impurities from the grains
- ✓ Clean the dead pockets of the cleaning line frequently, to get rid of non-moving grains at the elevator bottom & outlets, grains conveyor troughs, and tempered grain conveyors.
- ✓ Fumigate empty Grains bag.
- ✓ Before grinding, use scourers to remove dirt in tempered grains
- ✓ Regularly clean the Grinding equipment etc.
- ✓ Fumigate packing materials before every use.

- ✓ Frequently fumigate bins & conveyors.
- ✓ Always keep the parking area & the storage area clean.
- ✓ Type of packaging materials used.

3.2.Dal Packaging:

Packaging refers to the act of designing and producing the container or wrapper of a product. It is one of the most important parts of marketing.

There are many factors that need to consider while selecting a suitable type of pack for the product:

- ➢ The product contents.
- ➢ The application of the product.
- ➢ Content stability.
- ➢ Protection from any environmental factors
- ➢ Acceptability of the pack to the customer.
- ➢ Regulatory, legal, and quality issues.

Characteristics of packaging material:

The material selected must have the following characteristics:

- ✓ Must meet tamper-resistance requirements
- ✓ Must not reactive with the product
- ✓ They must protect the preparation from environmental conditions
- ✓ Must be non-toxic
- ✓ Must not impart odour/taste to the product
- ✓ Must be FDA approved.

Masoor dal is packed directly in gunny bags, gunny poly-line bags for bulk sale, and for retail sale in laminated pouches or poly-bags.

- ➢ **Hanging Bags-** Hanging bags in grocery stores and other shopping outlets are commonly used. They are a type of plastic bag that is also sealed with a back-middle seam on both ends as well. Hanging bags have a pre-cut hole that makes it easier for them to hang from hooks so that they can be seen in an attractive way.
- ➢ **Pillow bags -** A pillow bag is another typical type of package. The bags are named for their shape, which is like a cushion. They are found lying flat on grocery store shelves in the grocery store and were known to carry the items.

- **Gusseted Poly Bags-** Gusseted bags are often called flat-bottom bags because they feature a tucked in pleat that's been pressed flat. It allows the bag to expand for greater carrying capacity and to keep the shape of a box if necessary. These types of poly bags can be heat sealed, tied, stapled, or taped shut. They're the perfect poly bag for anyone looking to get more flour in a single bag.
- **Flexible Pouches-** Flexible pouches are a perfect way to carry most packaged items. They can be made with zipper-seal closures, which tend to keep the inside contents fresh for use. Flexible pouches offer amazing printing capabilities, so you can add your attractive product branding to the pouch itself. Many pouches stand up on their own, which helps you improve your shelf appearance.

3.3. Type of Packaging:

- **Primary packaging:** Primary packaging is packaging which is in close association with the product itself and is often referred to as a consumer unit. The main purpose of the primary packaging is to contain, protect and/or conserve the final product, in particular against contamination.
- **Secondary packaging:** Secondary packaging is the outer packaging of the main packaging, which connects packages and further covers or marks the prescription component.
- **Tertiary packaging:** Tertiary packaging is used for the handling, transportation, and delivery of bulk products.

3.4.Material of Packaging:

In addition to cellulose and Aluminium foil, a very large amount of polymeric materials is used for packaging products. Paper boards and metal containers are also used for such purposes. While a range of packaging materials are available, the ultimate option of the packaging depends on the appropriate shelf life, the efficiency of the packaging machine, and the cost that is purely based on the market segment targeted by the manufacturer. The most common choice of packaging medium is plastic (usually flexible) as it offers the requisite safety and preservation, resistance to grease, physical strength, machinability, and printability.

Plastics that are lighter in weight are also the most preferred material for the packaging of flour. There are changing trends in the packaging of Flour. Plastic films and their laminates

are increasingly used due to better properties and aluminium laminates due to price and better flex crack properties. Plastic packaging products that can be used are described below.

Polypropylene- Polypropylene films have better clarity than polyethylene and enjoy superior machinability due to stiffness. Lack of good salability has been a problem; however, PVDC and vinyl coating have been used to overcome this problem. Some varieties of PP have been specially developed for twist-wrap applications as they have the ability to lock in position after twisting.

Poly Vinyl Chloride (PVC)- PVC is a stiff and clear film having a low gas transmission rate. PVC can be used as small wraps, bags, and pouches. PVC when co-polymerized with polyvinylidene chloride is known as Saran. Since it is a costly material, it is only used as a coating to obtain barrier properties and heat salability. PVC film is also used for twist wraps, as it has twist retention properties and is excellent on high-speed machines.

Polyesters (PET) and Polyamide (PA) - Polyethylene terephthalate film has high tensile strength, gloss, and stiffness as well as puncture resistance. It has moderate WVTR but is a good barrier to volatiles and gases. To provide heat seal property, PET is normally laminated to other substrates. Nylons or polyamides are similar to PET but have high WVTR.

CHAPTER - 4
FOOD SAFETY & FSSAI STANDARDS

4.1.Introduction to FSSAI:

The Food Safety and Standards Authority of India (FSSAI) has been established under Food Safety and Standards, 2006 which consolidates various acts & orders that have hitherto handled food-related issues in various Departments. The FSSAI is responsible for setting standards for food so that there is one body to deal with and no confusion in the minds of consumers, traders, manufacturers, and investors. The Act aims to establish a single reference point for all matters relating to food safety and standards, by moving from multi-level, multi-departmental control to a single line of command.

Highlights of the Food Safety and Standard Act, 2006-

Various central Acts like Prevention of Food Adulteration Act, 1954 , Fruit Products Order , 1955, Meat Food Products Order , 1973, Vegetable Oil Products (Control) Order, 1947,Edible Oils Packaging (Regulation)Order 1988, Solvent Extracted Oil, De- Oiled Meal and Edible Flour (Control) Order, 1967, Milk and Milk Products Order, 1992 etc will be repealed after commencement of FSS Act, 2006.

The Act also aims to establish a single reference point for all matters relating to food safety and standards, by moving from multi- level, multi- departmental control to a single line of command. To this effect, the Act establishes an independent statutory Authority – the Food Safety and Standards Authority of India with head office at Delhi. Food Safety and Standards Authority of India (FSSAI) and the State Food Safety Authorities shall enforce various provisions of the Act.

Establishment of the Authority-

Ministry of Health & Family Welfare, Government of India is the Administrative Ministry for the implementation of FSSAI. The Chairperson and Chief Executive Officer of Food Safety and Standards Authority of India (FSSAI) have already been appointed by Government of India. The Chairperson is in the rank of Secretary to Government of India.

4.2. FSSAI Registration & Licensing Process:

According to Section 31(1) of Food Safety and Standards (FSS) Act, 2006,Every Food Business Operator (FBO) in the country is required to be licensed under the Food Safety & Standards Authority of India (FSSAI).

As per FSS (Licensing & Registration) Regulations, 2011, Licenses and Registrations are granted to FBOs in a 3 tier system

- Registration - for petty FBOs with annual turnover less than Rs 12 lakhs
- State license - for medium-scale food manufacturers, processor and transporters
- Central License - for large-scale food manufacturers, processor and transporters

FSSAI registration is done online on the FSSAI website through Food Safety Compliance System (FoSCoS)

- FoSCoS has replaced the Food Licensing and Registration System (FLRS).
- Petty food business operators are required to obtain FSSAI Registration Certificate
- "Petty Food Manufacturer" means any food manufacturer, whomanufactures or sells any article of food himself or a petty retailer, hawker, itinerant vendor or temporary stall holder (or) distributes foods including in any religious or social gathering except a caterer;

or

- Other food businesses including small scale or cottage or such other industries relating to food business or tiny food businesses with an annual turnover not exceeding Rs. 12lakhs and/or whose production capacity of food (other than milk and milk products and meat and meat products) does not exceed 100 kg/ltr per day

Any person or entity that does not classify as a petty food business operator is required to obtain an FSSAI license for operating a food business in India.

FSSAI License - two types - State FSSAI License and central FSSAI License

Based on the size and nature of the business, the licensing authority would change.

- Large food manufacturer/processors/transporters and importers of food products require central FSSAI license
- Medium-sized food manufacturers, processor and transporters requires state FSSAI license.
- License period: 1 to 5 years as requested by the FBO.
- A higher fee for obtaining FSSAI license for more years.

- If a FBO has obtained the license for one or two years, renewal may be done, no later than 30 days prior to the expiry date of the license.

4.3. Food Safety & FSSAI Standards & Regulations:

2.4.6 Food grains: 2.4.6 (22)Pulses: This standard applies to the whole or shelled (de-husked) or split pulses and they shall be free from toxic or noxious seeds and added coloring matter and also applies to mix of various pulses covered in this standard.

- The following pulses shall be covered under his standards, namely:-

i. Lentil (Masur) - Lenil esculenta Moench or Lens culinaris Medik or Ervem lens Linn;
ii. Black gram (Urd) – Phaseolus mungoLinn;
iii. Green gram (Moong) - Phaseolus aureus Roxb., Phaseolus radiatus Roxb;
iv. Bengal gram (Chana or Chick pea) or Kabuli chana or Chhole or(green chick pea) hara chana - Cicer arietinum Linn;
v. Red gram (Arhar) – Cajanus cajan (L) Millsp;
vi. Horse gram (Kulthi) –Dolichosbiflorus;
vii. Field bean (Black, Brown, White), Sem - Phaseolus vulgaris ;
viii. Peas dry (Matra) –Pisumsativum;
ix. Soybean – Glycine max Merr.);
x. Rajmah or Double beans or Broad beans or Black beans – (Phaseolus vulgaris); (XI) Lobia or black eyed beans or black eyed white lobia – (Vignacatjang);
xi. Moth bean (matki) – (Phaseolusaconitifolius Jacq.).

The pulses shall conform to the following standards, namely:-

Sl. No.	Parameter	**Limit**	
i.	Moisture Content (per cent. by mass), Max.	14	Pulses without seed coat - 12
ii.	Extraneous Matter	Not more than 1 per cent. by mass of which not more than 0.25 per cent. by mass shall be mineral matter and not more	

		than 0.10 per cent. by mass shall be impurities of animal origin.
iii.	Defects (I) Seeds with serious defects. (Seeds in which the cotyledons have been affected or attacked by pests; seeds with very slight traces of mould or decay; or slight cotyledon staining.)	Not more than 1 per cent.
iv.	II) Seeds with slight defects. (Seeds which have not reached normal development; seeds with extensive seedcoat staining, without the cotyledon being affected; seeds in which the seedcoat is wrinkled, with pronounced folding or broken pulses)	Not more than 7 per cent. Of which broken pulses must not Exceed 3 per cent.
v.	Other edible pulses/ grains ,by mass	Not more than 2 per cent.
vi.	Discoloured seeds by mass	Not more than 3 per cent.
vii.	Uric acid (not more than)	100 mg per kg.

Food Safety

Part I - General Hygienic and Sanitary practices to be followed by Petty Food Business Operators applying for Registration

SANITARY AND HYGIENIC REQUIREMENTS FOR FOOD MANUFACTURER/ PROCESSOR/HANDLER

The place where food is manufactured, processed or handled shall comply with the following requirements:

1. The premises shall be located in a sanitary place and free from filthy surroundings and shall maintain overall hygienic environment. All new units shall set up away from environmentally polluted areas.

2. The premises to conduct food business for manufacturing should have adequate space for manufacturing and storage to maintain overall hygienic environment.

3. The premises shall be clean, adequately lighted and ventilated and sufficient free space for movement.

4. Floors, Ceilings and walls must be maintained in a sound condition. They should be smooth and easy to clean with no flaking paint or plaster.

5. The floor and skirted walls shall be washed as per requirement with an effective disinfectant the premises shall be kept free from all insects. No spraying shall be done during the conduct of business, but instead fly swats/ flaps should be used to kill spray flies getting into the premises. Windows, doors and other openings shall be fitted with net or screen, as appropriate to make the premise insect free The water used in the manufacturing shall be potable and if required chemical and bacteriological examination of the water shall be done at regular intervals at any recognized laboratory.

6. Continuous supply of potable water shall be ensured in the premises. In case of intermittent water supply, adequate storage arrangement for water used in food or washing shall be made.

7. Equipment and machinery when employed shall be of such design which will permit easy cleaning. Arrangements for cleaning of containers, tables, working parts of machinery, etc. shall be provided.

8. No vessel, container or other equipment, the use of which is likely to cause metallic contamination injurious to health shall be employed in the preparation, packing or storage of food. (Copper or brass vessels shall have proper lining).

9. All equipments shall be kept clean, washed, dried and stacked at the close of business to ensure freedom from growth of mould/ fungi and infestation.

10. All equipments shall be placed well away from the walls to allow proper inspection.

11. There should be efficient drainage system and there shall be adequate provisions for disposal of refuse.

12. The workers working in processing and preparation shall use clean aprons, hand gloves, and head wears.

13. Persons suffering from infectious diseases shall not be permitted to work. Any cuts or wounds shall remain covered at all time and the person should not be allowed to come in direct contact with food.

14. All food handlers shall keep their finger nails trimmed, clean and wash their hands with soap, or detergent and water before commencing work and every time after using toilet. Scratching of body parts, hair shall be avoided during food handling processes.

15. All food handlers should avoid wearing, false nails or other items or loose jewellery that might fall into food and also avoid touching their face or hair.

16. Eating, chewing, smoking, spitting and nose blowing shall be prohibited within the premises especially while handling food.

17. All articles that are stored or are intended for sale shall be fit for consumption and have proper cover to avoid contamination.

18. The vehicles used to transport foods must be maintained in good repair and kept clean.

19. Foods while in transport in packaged form or in containers shall maintain the required temperature.

20. Insecticides / disinfectants shall be kept and stored separately and `away from food manufacturing / storing/ handling areas.

4.4 Labelling Standards(Regulation 2.5 of FSS)

Labelling requirements for packaged food products as laid down in the Part 2.4 of the Prevention of Food Adulteration (PFA) Rules, 1955, and the Standards of Weights and Measures (Packaged Commodities) Rules of 1977, require that the labels contain the following information:

1. Name, trade name or description
2. Name of ingredients used in the product in descending order of their composition by weight or volume

3. Name and complete address of manufacturer/packer, importer, country of origin of the imported food (if the food article is manufactured outside India, but packed in India)
4. Nutritional Information
5. Information Relating to Food Additives, Colors and Flavors
6. Instructions for Use
7. Veg or Non-Veg Symbol
8. Net weight, number or volume of contents
9. Distinctive batch, lot or code number
10. Month and year of manufacture and packaging
11. Month and year by which the product is best consumed
12. Maximum retail price

Provided that — (i) the nutritional information may not be necessary, in case of foods such as raw agricultural commodities, like, wheat, rice, cereals, flour, spice mixes, herbs, condiments, table salt, sugar, jaggery, or non –nutritive products, like, soluble tea, coffee, soluble coffee, coffee-chicory mixture, packaged drinking water, packaged mineral water, alcoholic beverages or flour and vegetables, processed and pre- packaged assorted vegetables, flours, vegetables and products that comprise of single ingredient, pickles, papad, or foods served for immediate consumption such as served in hospitals, hotels or by food services vendors or halwais, or food shipped in bulk which is not for sale in that form to consumers.

Wherever applicable, the product label also must contains the following

The purpose of irradiation and license number in case of irradiated food. Extraneous addition of coloring material.

Non-vegetarian food – any food which contains whole or part of any animal including birds, fresh water or marine animals, eggs or product of any animal origin as an ingredient, not including milk or milk products – must have a symbol of a brown color-filled circle inside a brown square outline prominently displayed on the package, contrasting against the background on the display label in close proximity to the name or brand name of the food.

Vegetarian food must have a similar symbol of green color-filled circle inside a square with a green outline prominently displayed.

All declarations may be: Printed in English or Hindi on a label securely affixed to the package, or Made on an additional wrapper containing the imported package, or Printed on

the package itself, or May be made on a card or tape affixed firmly to the package and bearing the required information prior to customs clearance.

Exporters should review the Chapter 2 of the “FSS (Packaging and Labelling) Regulation 2011” and the Compendium of Food Safety and Standards (Packaging and Labelling) Regulation before designing labels for products to be exported to India. FSSAI revised the labelling Regulation and a draft notification to that effect was published on April 11, 2018, inviting comments from WTO member countries and the comments received are under review and the publication date remains unknown.

According to the FSS Packaging and Labelling Regulation 2011, “pre-packaged” or “pre packed food” including multi-piece packages, should carry mandatory information on the label.

CHAPTER - 5
OPPORTUNITIES FOR MICRO/UNORGANIZED ENTERPRISES

5.1.PM-FME Scheme:

Ministry of Food Processing Industries (MoFPI), in partnership with the States, has launched an all India centrally sponsored "PM Formalisation of Micro Food Processing Enterprises Scheme (PM FME Scheme)" for providing financial, technical and business support for up-gradation of existing micro food processing enterprises. The objectives of the scheme are :

I. Support for capital investment for up-gradation and formalization with registration for GST, FSSAI hygiene standards and Udyog Aadhar;
II. Capacity building through skill training, imparting technical knowledge on food safety, standards & hygiene and quality improvement;
III. Hand holding support for preparation of DPR, availing bank loan and up-gradation;
IV. Support to Farmer Producer Organizations (FPOs), Self Help Groups (SHGs), producers cooperatives for capital investment, common infrastructure and support branding and marketing.[ii]

References

[i] http://dpd.gov.in/Lentil.PDF
[ii] https://mofpi.nic.in/pmfme/docs/SchemeBrochureI.pdf