Ministry of Food Processing Industries
Government of India

सत्यमेव जयते

NIFTEM
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PROCESSING OF BESAN

AATMANIRBHAR BHARAT

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

INTRODUCTION

INDUSTRIAL OVERVIEW

- The edible seeds of plants in the family of legumes are pulses.
- Elven types of pulses are recognized by food and agriculture organization (FAO): dry beans, dry large beans, dry peas, chickpeas, cow peas, pigeon peas, lentils, Bambara beans, vetches, lupines, and pulses.
- Dal is sometimes referred to as' lentils' but simply refers to a split variant of a variety of lentils, peas, chickpeas, kidney beans, etc.
- Sustainable agriculture is also supported by growing pulses, as pulse crops help reduce greenhouse gases, improve soil quality and use less water than other crops.

INTRODUCTION

INDUSTRIAL OVERVIEW
TYPES OF PULSES

Pulses can be :

- Split & Skinned lentils
- Split Lentils
- Whole Lentils & Pulses

IMAGE	ENGLISH NAME	HINDI NAME
	Yellow split pigeon peas	Arhar dal, Toor dal, Tuvar dal
	Split & skinned green gram, yellow lentils	Moong dal, Mung dal
	Red lentils	Lal masoor dal
	Split & skinned black gram	Urad dal
	Split Bengal gram lentil	Chana dal
	Green Gram, Mung bean	Sabot moong, Hari moong dal

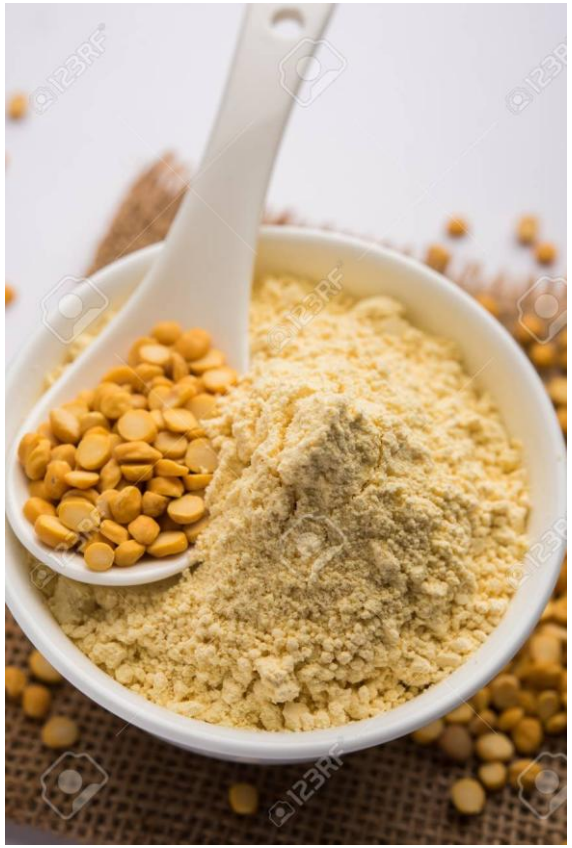
INTRODUCTION

INDUSTRIAL OVERVIEW
TYPES OF PULSES

IMAGE	ENGLISH NAME	HINDI NAME
	Black Gram	Sabut urad dal, maaki dal
	Indian Brown Lentils	Kali Masoor
	Horse Gram	Kulthi
	Chickpeas, Garbanzo beans	Kabuli chana, Chole
	Black chickpeas	Kale chane
	Red Kidney Beans	Rajma
	Black Eyed Peas	Lobia, Chavle, Raungi
	Dried white peas	Sukhe safed matar, safedvatana

INTRODUCTION

PRODUCT DESCRIPTION



- BESAN is a product obtained by grinding, dried and decuticled Bengal Gram.
- It is yellowish in colour and possesses characteristic Bengal gram taste and smell.
- Gram/Besan has a high percentage of carbohydrates, a higher percentage of fibre than other pulses, no gluten, and a higher percentage of protein than other pulses.
- Chickpea, chana or gram Besan, is widely used in India and parts of the Mediterranean as well. It is also fine as a thickener in various kinds of fries in curries and coatings.

INTRODUCTION

PRODUCT DESCRIPTION

It is also used as a facial mask mixing with milk or yogurt and turmeric, and is popular among young women in Asia.

This face mask has been shown to be effective as a skin cleanser and whitening.

Besan is a very important ingredient, so it enjoys continuous use throughout the year in Indian kitchens.

INTRODUCTION

MARKET POTENTIAL

- The global demand for pulses is mainly driven by the growing consumption of different pulses and bakery products in different regions.
- With an annual production volume of more than 5 million tons, Besan is a high potential market in India; that is, over 50 percent of the approximately 10 million tons of desi Chickpeas produced in India.
- Market demand for Besan is largely dependent on the freshness, consistency and fineness of the grinding process.
- In the Asia Pacific region, the demand for pulses is projected to rise at the highest CAGR in terms of both volume and value between 2017 and 2022.
- With countries such as India, China, Australia, Japan, Myanmar, Thailand, the Philippines, and Malaysia contributing to the high consumption of various food products produced using pulse ingredients, the region is the largest user of pulses

INTRODUCTION

RAW MATERIAL DESCRIPTION

- Basic raw material required in the proposed Besan unit is “split & skinned Bengal Gram”.
- It is a product obtained through Bengal Gram grinding, drying and de-cuticulating.
- Khesaru dal and other products are not supposed to be added in true besan flour for colouring.
- The pulse proteins are lysine-rich and have low sulphur levels.
- Bengal gram collection and blending of various Bengal gram varieties is a key factor in the development of the right quality and right price besan

INTRODUCTION

TYPES OF RAW MATERIAL

SL.	VARIETY NAME	YEAR OF RELEASE	YIELD Q/HA
1	Pusa 408	1985	22-25
2	Gaurav	1983	20-24
3	GNG 146	1985	22-25
4	RSG 2	1984	16-20
5	Pusa 413	1985	18-80
6	Pusa 240	1985	18-20
7	Pusa 261	1985	20-22
8	Pusa 244	1985	20-22
9	Pusa 417	1985	20-22
10	JG 315	1984	15-18
11	RSG 44	1991	20-23

INTRODUCTION

TYPES OF RAW MATERIAL

SL.	VARIETY NAME	YEAR OF RELEASE	YIELD Q/HA
12	Pusa 256	1985	20-23
13	Phule G 5	1986	20-22
14	Pusa 267 (Kabuli)	1988	20-25
15	H 82-2 (Haryana chana-1)	1990	20-22
16	GL 83119 (PBG-1)	1988	22-25
17	Pusa 329	1993	22-23
18	KPG 59 (Uday)	1992	20-22
19	PDG 84-10	-	18-20
20	w 39-2	-	20-22
21	ICCV-10 (Bharti)	1992	15-18
22	Pusa 372	1993	20-22
23	Pusa 362	-	23-24

PROCESS & MACHINERY REQUIREMENT

RAW MATERIAL ASPECTS

NUTRIENTS	AMOUNT (100 g)
TOTAL CARBOHYDRATE	23 G
TOTAL FAT	2.8 G
PROTEIN	7.1 G
SODIUM	246 MG
CALCIUM	40 MG
IRON	60 MG
POTASSIUM	875 MG
VITAMIN A	20 MG

- There is a large amount of iron, sodium, selenium, and a small amount of copper and manganese zinc in Bengal gram.
- They are a source of protein , folic acid, fibre, phytochemicals that can serve as antioxidants, called saponins.
- There are two chickpea varieties: the larger light tan Kabuli and the multi-colored Desi chickpea.
- When picked early, they are green and range from tan or beige, speckled, dark brown to black.

PROCESS & MACHINERY REQUIREMENT

SOURCES OF RAW MATERIAL

- Gram is the most significant pulse crop in India, commonly known as chick pea or Bengal gram.
- Fresh green leaves are used as vegetables, while chickpea straw is an outstanding cattle food.
- The principal gram-growing countries are India, Pakistan, Ethiopia, Burma and Turkey.
- With regard to production and acreage, India ranks first in the world, followed by Pakistan.
- In India, the main gram producing states are Madhya Pradesh, Rajasthan, Uttar Pradesh, Haryana, Maharashtra and Punjab.
- Gram is classified into two classes on the basis of the size, color and shape of seeds: 1) Desi or brown gram 2) Kabuli or white gram. Compared to the Desi gram, the yield capacity of kabuli is low.

PROCESS & MACHINERY REQUIREMENT

TECHNOLOGIES

SADDLE STONE

- Besan is made in rural areas and at home scale level in Atta *chakki*. Capacities of such machines vary between 50-100 kg per hour.
- this would have been done by dehusking and then grinding the gram seed between two stones, a lower, stationary stone called the **quern stone**, and an upper, mobile stone called the **hand stone**.
- A saddle stone is a piece of hard stone that is cradle-shaped and carries the grains or dal or seeds. The sandstone will have been either a cylindrical piece of stone or a disc held in one hand with a vertical handle on its back (rather like an upside-down mushroom).
- The dal joins the quern through a hole at the middle of the runner stone and migrates when it is ground to the edge, emerging as a coarsen ground floor from between the stones.

PROCESS & MACHINERY REQUIREMENT

TECHNOLOGIES

MULTIPURPOSE PULSE AND GRAIN MILLS

- On top, the grinding chamber consists of a serrated ratchet liner and a classification panel at the bottom.
- The feed material is manually passed through a hopper into the grinding chamber. Depending on the desired fineness, the ground power is collected in a way fitted below the screen.
- For small-scale industries or beginners, these Multipurpose Pulses and Grains Mills are ideally suited

PROCESS & MACHINERY REQUIREMENT

TECHNOLOGIES

SCREEN LESS IMPACT PULVERIZER

- An enclosed rotor carrying swing hammers, a whizzer classifier for fineness regulation and a pressure gradient creator mounted on a solid shaft are the impact pulverizer.
- Raw material to be pulverized enters through the hopper or the automatic rotary feeder into the crushing chamber.
- It is reduced to fine powder by the effect of the hammers on the feed material on the liner plates.
- . In the system, a dust collector is provided to ensure less running of the dust and no loss of ground powder.

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PROCESS & MACHINERY REQUIREMENT

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MANUFACURING PROCESS

- **THE PROCESS IS AS FOLLOWS**:

➢ **Pre Cleaning**: - Eliminate broken grains, dirt, similar sized impurities, leaves and other impurities from Gram.

➢ **De-stoning-** Remove the pebbles and another small foreign particle from the Gram seed.

➢ **De-husking-** The process of removal of husk or outer layer from the cotyledons is called dehusking it is a necessary process to improve the quality of the final product. The dehusking machine used for this process.

➢ **Cleaning:** After De-husking, the gram is taken to the cleaning section where the other layer is separated from the seed through the aspirator.

➢ **Grinding:** Hulled grams are then fed to a Heavy-duty Pulverizer. this machine simply grinds these grams into a fine powder.

➢ **Packaging:** Finally, Besan is packed directly in gunny bags, poly-line gunny bags for bulk selling, and in laminated pouches or poly-bags for retail selling.

PROCESS & MACHINERY REQUIREMENT

FLOW CHART

STEPS	MACHINE NAME	DESCRIPTION	MACHINE IMAGE.
Gram Delivery	Unloading Bins	These are large bins designed for unloading of Grams & similar product; they are equipped with large rod mess to prevent big impurities from entering system.	
Storage	Storage Tank	These Equipment are class of storage Equipment which are specifically designed for dry Dal or similar products (Raw material) of small granule composition.	
Pre- Cleaning	Aspirator	It's a more fine-tuned separator designed to remove finer impurities like remaining dirt, similar sized impurities, leaves etc	

PROCESS & MACHINERY REQUIREMENT

FLOW CHART

STEPS	MACHINE NAME	DESCRIPTION	MACHINE IMAGE.
De-stoning	De-stoner	Remove the pebbles and another small foreign particle from the Gram seed.	
Grinding	Heavy-duty Pulverizer	It's a grinding class Machine, used for grinding grams to a fine powder.	
Sifting	Sifter	This machine used for screening, sieving, grading Besan flour.	
Packaging	Automatic packaging machine	It's a simple packaging machine, designed to fill the given food grade plastic material's continuous pouch with required product after sealing one end & after filling sealing the other end also.	

PROCESS & MACHINERY REQUIREMENT

ADDITIONAL MACHINE & EQUIPMENTS

MACHINE	DEFINITION	IMAGE
Disc Separator	It's a separator class machine, generally used to remove foreign grains from required grain efficiently	
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.	
Food Grade Conveyor	These are conveyors with food grade belt to maintain food safety	

PROCESS & MACHINERY REQUIREMENT

GENERAL FAILURES & REMEDIES

General Failures	Remedies
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.
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.
Mechanical Key Failure	1. Ensure that mechanical keys are replaced as per there pre-defined operational life. 2. Prevent Overloading.
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.
Hulling	1. Gram has the whole- hull intact. Extra cleaning required for Gramm flour milling to sift out the impurities (dirt, chaff, etc.)

PROCESS & MACHINERY REQUIREMENT

NUTRITIONAL INFORMATION

NUTRITIONAL INFORMATION PER 100G BESAN

Energy	1,619 kJ (387 kcal)	
Carbohydrates	57 g	
Sugars	10 g	
Dietary Fiber	10 g	
Fat	6 g	
Protein	22 g	
Vitamins	**Quantity**	**%DV+**
Niacin (B3)	1 mg	7%
Folate (B9)	437 ug	109%
Minerals	**Quantity**	**%DV+**
Calcium	45 mg	5%
Iron	4mg	31%

NUTRITIONAL INFORMATION PER 100G BESAN

Minerals	**Quantity**	**%DV+**
Magnesium	166 mg	47%
Phosphorus	318 mg	45%
Potassium	846 mg	18%
Selenium	8 ug	11%
Sodium	64 mg	4%
Zinc	2 mg	21%
Other Constituents	**Quantity**	
Water	10 g	

PROCESS & MACHINERY REQUIREMENT

EXPORT POTENTIAL & SALES ASPECT

- India is the world's largest growing country, accounting for 61.65% of the world's total gram area under Bengal during 2002 and 68.13% of the world's total output.
- It is a complement to cereal-based diets rich in protein, especially for the poor in developing countries where people are vegetarians or are unable to afford animal protein
- India has exported about 12,000 tons of besan worth Rs. 7800 lakhs in year 2015-16 (APEDA) mainly to USA, UK, Australia, Kuwait, Canada, New Zealand, UAE, Singapore, Saudi Arabia, Oman and other countries.

OPPORTUNITIES FOR MICRO/UNORGANIZED ENTERPRISES

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

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