



PM Formalisation of Micro Food Processing Enterprises Scheme

Processing of Papad



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CHAPTER 1

INTRODUCTION

1.1. Papad

Food processing includes many forms of processing foods, from grinding grain to make raw flour to home cooking to complex industrial methods used to make convenience foods. Women entrepreneurs in rural & urban parts of Maharashtra are bringing about a steady and silent change in the health sector with agro-based products such as papad& vermicelli. The Papad making industry is one of the home-based processing units which have provided ample opportunity



for employment to women of low socioeconomic status. The majority of the food units are in primary processing. The papad and vermicelli making business is generally a women-centric business in India and mostly done in the rural areas. Among the traditional savory food, 'Papad' also known as Appalam, papadam, is a popular tasty food item in Indian dietary science times immemorial and is in great demand always because most of the people like papads as one of the items in the daily lunch and dinner menu to make the food tastier. It is a low moisture food consumed either after frying or roasting or as an adjunct with vegetable soups and curries. Snack foods, ready to eat foods, convenient foods etc. are in a great demand as a part of diet both in developing and developed countries. Papad is a popular and tasty food item in the Indian diet since many centuries. Combination of Pulses, Cereals, cereals, fruits, roots and tubers used for preparation of papad varies from one region to another depending upon the preferences of local people. Papad is a traditional food item having a thin -crispy wafer like texture which is consumed as an accompaniment along with the meals and snacks for papad is steadily growing across the country there are couple of nation brands available but the market is predominantly controlled by local brands.

1.2. Importance of papad

Papad is a good appetizer and a source for digestion. Roasted or grilled papad helps to absorb the fatty material from the mouth and throat. Papad should be eaten in moderate proportion; else it can become the reason for acidity. Papad is very high in sodium, hence not advisable for hypertensive people. Papad are made of lentils, hence are free from gluten, rich in protein and dietary fiber.

1.3. Black gram

Botanical Name -	Vigna mungo
Origin -	India
Synonym -	Urd, Biri, Mash



1.3.1. Origin of black gram

Black gram originated in South Asia, where it has been in cultivation from ancient times and is one of the most highly prized pulses of India. It is very widely used in Indian cuisine. In India the Black gram is one of the important pulses grown in both Kharif and Rabi seasons. This crop is extensively grown in Nagapattinam, Thiruvarur, Cuddalore, Thoothukudi, Tirunelveli, and Villupuram districts of Tamilnadu. The



Coastal Andhra region in Andhra Pradesh is known for black gram. It is consumed in the form of 'dal' (whole or split, husked and un-husked) or perched. Grounded urad dal is used for making papad. It is also green manuring crop. High values of lysine make urdbean an excellent complement to rice in terms of balanced human nutrition.

1.3.2. Nutritional Value of Raw Black Gram per 100 grams

S. No.	Particular	Qty
1.	Energy	341 Kcal
2.	Carbohydrates	58.99 g
3.	Protein	25.21 g
4.	Total Fat	1.64 g
5.	Dietary Fiber	18.3 g
6.	Folates	216 mg
7.	Niacin	1.447 mg
8.	Pantothenic acid	0.906 mg
9.	Pyridoxine	0.281 mg
10.	Riboflavin	0.254 mg
11.	Thiamin	0.273 mg
12.	Vitamin-A	23 IU 1%
13.	Sodium	38 mg
14.	Potassium	983 mg
15.	Calcium	138 mg
16.	Copper	0.981 mg
17.	Iron	7.57 mg
18.	Magnesium	267 mg
19.	Phosphorus	379 mg

*Source as per the USDA

1.3.3. Commercially grown varieties

State wise recommended varieties

State	Varieties		
	Kharif	Rabi	spring/summer
Andhra Pradesh	Pant Urd-31, IPU 2-43, LBG 685, LBG 625	TU 94-2, LBG 623, LBG 709, LBG 611	TU 94-2, LBG 623, LBG 709, LBG 611
Assam	PU-30, WBU -108, IPU 94-1 (Uttara)	-	-
Bihar & Jharkhand	Pant Urd 31, WBU 108, IPU 94-1 (Uttara), Birsa Urd 1, PU-30	-	Pant Urd 31, WBU-109, KU 91-2 (AZAD Urd 1)
Gujarat	Ku 96-3, TPU-4, AKU-4 (Melghat), GU-1, KUG-479, UH 01, Mash-414	-	-
Haryana	KU-300 (Shekhar 2), IPU 94-1 (Uttara)	-	-
H.P.	Pant Urd 31, Pant Urd 40	-	-
Karnataka	IPU 02-43, WBU-108, KU-301, LBG 402	IPU 2-43, WBU-108, KU-301	-
M.P. & C.G.	Pant Urd-30, JU-3, KU 96-3, TPU-4, JU-2, Khargone-3	Pant Urd 31	Pant Urd 31
Maharashtra	KU 96-3, TPU 4, AKU-4 (Melghat), AKU-15	-	-
Odisha	IPU 02-43, WBU-108, KU 301	B-3-8-8, OBG-17, Mash 338	B 3-8-8, OBG 17, Mash 338
Punjab	WBU 108, IPU 94-1 (Uttara), Mash 338, Mash 414	-	KU 300 (Shekhar 2), KUG 479
Rajasthan	Pant Urd-31, WBU 108, IPU 94-1 (Uttara)	-	KU 300 (Shekhar 2), KUG 479
U.P. & Uttarakhand	Pant Urd-40, WBU-108, IPU 94-1 (Uttara)	-	KU 300, WBU 109, KU 91 (Azad Urd 2) KUG-479, Narendra Urd 1
Tamil Nadu	IPU 02-43, Vamban-4, Vamban-7	Vamban-3, TU 94-2	Vamban 3, TU 94-2, Vamban 5, Vamban 2
West Bengal	Pant Urd 31, WBU 108, IPU 94-1	Pant Urd-31, WBU- 190, KU 92-	Pant Urd 31, WBU 109, KU

	(Uttara)	1 (Azad Urd-1)	91-2 (AZAD Urd 1)
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Source: Seednet GOI, Min. of Agri. & FW, & ICAR-IIPR, Kanpur

1.3.4. Cultivation Scenario

During the twelfth Plan (2012-2015) the total production was 18.29 lakh tonnes on an area of 31.29 lakh hectares. As regards the total contribution from states, Madhya Pradesh stand first in respect of area (19.40%) followed by U.P. (17.88%) and Andhra Pradesh (11.69%), whereas in production U.P. stands first (16.98%) followed by Andhra Pradesh (16.75%) and Madhya Pradesh (15.07%). The highest yield was recorded by the state of Bihar (898 kg/ha) followed by Sikkim (895 kg/ha) and Jharkhand (890 kg/ha) the National yield average was (585 kg/ha). The lowest yield was recorded in the state of C.G. (309 kg/ha) followed by Odisha (326 kg/ha) and J&K (385 kg/ha).

1.3.5. Current status of Black gram

Black gram is a highly priced pulse, very rich in phosphoric acid. India currently represents the largest producer of black gram accounting for more than 70% of the global production. India is followed by Myanmar and Pakistan. In India during kharif 2019-20, area covered under black gram is 37.52 lakh ha as against 38.18 lakh ha in last year. The states of Madhya Pradesh (16.50 lakh ha), Uttar Pradesh (7.01 lakh ha), Rajasthan (4.56 lakh ha), Maharashtra (2.87 lakh ha), Karnataka (0.687 lakh ha) and Andhra Pradesh (0.11 lakh ha) are the major producers of black gram in India during Kharif. In Telangana area coverage under black gram during kharif 2019-20 is 22738 ha and major growing districts are Sangareddy (8402 ha), Vikarabad (3345 ha), Nirmal (3686 ha), Kamareddy (3883 ha), Medak (729 ha) and Adilabad (1254 ha).

1.3.6. Pharmacological properties of urad bean

Part	Extract	Pharmacological Properties
Seed	Aqueous: methanol (80:20)	Antioxidant
	Petroleum ether or alcohol	Immunostimulatory
	Petroleum ether, ethanol/water	Immunomodulatory
	Methanol, chloroform	Aphrodisiac
	Petroleum ether or alcohol;	Antihyperlipidemic
	Petroleum ether, acetone	Petroleum ether, acetone
	Aqueous	Anticonvulsant
	Hydroalcoholic	Anti-osteoarthritic
	Methanol	Antidiabetic
	Aqueous	Hepatoprotective and nephroprotective
	Aqueous	Antifungal
		Antiviral (HIV reverse transcriptase inhibition)
Pulses	Tris-HCl	Enterokinase inhibition
	Methanol	Antimicrobial
	Cooked pulse	Antidiabetic
Leaves	Petroleum ether	Hepatoprotective against CCl ₄ toxicit
	Methanol	Analgesic and anti-inflammatory
	Ethanol	Anti-oxidant and nootropic and Diuretic

Source: Mehreen Zaheer et al. *A review of medicinal uses, phytochemistry and pharmacology of Vigna mungo (L.) Hepp.*

1.3.7. Health benefits of Black Gram

There are many health benefits of black gram including its ability to aid in digestion, boost energy, improve skin health, and many others.

Improves Digestion

Like many other types of beans, a black gram is very high in fiber, which can help to remedy any gastrointestinal issues you might be suffering from. Dietary fiber is able to help bulk up the stool and stimulate peristaltic motion. This can help to reduce symptoms of constipation, diarrhea, bloating, and cramping, as well as other more serious health concerns in your gut. The fiber found in black gram can also help optimize nutrient absorption, ensuring that you get the most out of your meals.



Boosts Energy

The significant levels of iron found in black gram make it an ideal way to boost energy and increase vitality. Iron is a key element in the production of red blood cells, which can increase oxygenated blood flow to the organs and extremities, thereby increasing energy. Iron also prevents anemia, which is characterized by fatigue, weakness, and cognitive weakness.

Improves Bone Mineral Density

There is a wide range of minerals found in black gram, including calcium, phosphorus, potassium, iron, and magnesium, all of which play their part in maintaining bone mineral density. As we age, our bones begin to break down and our joints get weak, opening the door for arthritis and osteoporosis. However, maintaining a diet that is high in key minerals can help keep you strong and resilient against age-related disorders.

Manage Diabetes

Fiber is a commonly recommended food for people who are dealing with diabetes or are at high risk of developing the disorder. Fiber is very effective for regulating the uptake of nutrients in the gut, and can, therefore, balance the levels of insulin and glucose in the blood. By preventing those dangerous spikes and drops in blood sugar levels, you can take another step towards diabetes reversal.

Skin Care

Ayurvedic remedies used decoctions and pastes made of the black gram for almost every skin condition you can imagine. The concentrated mineral and vitamin content made it perfect for relieving inflammation, getting rid of beauty marks, promoting rapid healing and exfoliation, and stimulating the flow of oxygenated blood to the surface of the skin. It can also help soothe the pain of sunburns, reduce the intensity of a tan, and lessen the symptoms of acne.

Reduces Pain & Inflammation

For pain relief and inflammation throughout the body, a black gram is one of the oldest and most trusted Ayurvedic remedies. The combination of minerals and vitamins, in addition to boosting the metabolism and cutting down oxidative stress, can soothe irritated areas in the body. A decoction made with black gram, or the extract itself, can be topically applied to aching joints of painful areas for fast relief.

Protects Heart Health

The combination of fiber, potassium, and magnesium found in black gram can do wonders for your heart health. The fiber is an effective way to balance cholesterol levels and prevent atherosclerosis, while the potassium can reduce tension in blood vessels and arteries, effectively lowering blood pressure. Finally, magnesium helps to stimulate circulation, along with iron, ensuring that your entire circulatory and cardiovascular systems are working together for the same goals.

1.4. Uses of Papad

- Papad is a great accompaniment with drinks and mocktails, one of the best examples is masala papad.
- Papad are typically served as an accompaniment with any meal in India.
- Papad can be eaten as a starter or snack dish.
- Fried, roasted, open-flame papad and oven-made papad are some of the best varieties of papad.
- A famous Rajasthani delicacy is papad curry or papad ki sabji, that is made from the papad only.
- Papad can be enjoyed with variety of pickles, chutneys and sauces.



- You can get papad of several flavors of your choice, such as Punjabi masala, urad dal, moong dal, asafoetida, black Pepper, green chilli, red chilli, cumin, garlic, ginger, cardamom, cloves and cinnamon, etc.
- Since the years, Papad has been used to serve with dal and rice, as it enhances the taste of the meal.
- You can munch the Papad as a great snack dish.
- Papad can be served with soup or with the main meal.
- Papad is often crushed and sprinkled on the rice.
- A traditional Indian thali, platter, marriage buffets, parties, etc always includes papad in their menu.
- You can crush the raw papads for coating the kebabs and tikkis.
- Papad is used for making several Gujarati subzis like Methi- Papad nu shaak, Ghatia-papad nu shaak, etc.

1.5. Health benefit of Papad

- Papad is a good appetizer and a source for digestive.
- Roasted or grilled papad helps to absorb the fatty material from the mouth and throat.
- Papad should be eaten in moderate proportion, else it can become the reason of acidity.
- Papad is very high in sodium, hence not advisable for hypertensive people.
- Papads are made of lentils, hence are free from gluten, rich in protein and dietary fiber.

1.6. Other value added papad product

- Rice papad:
- Uradal papad
- Black Pepper Papad
- Tapioca Sabudana Papad
- Potato Papad
- Ragi Papad
- Garlic Papad

CHAPTER 2

Processing of Papad

2.1. Process Flow chart for Papad Making



2.2. Manufacturing process

Black gram dhal (urad dhal) is first cleaned by passing through the designer to remove stones. It is then ground fine in the hammer mill and then passed through a sieve to remove fiber and coarse material. The material passing through the sieve is collected, weighed and the desired quantities are taken to the kneading machine. Salt and spices and sodium-bicarbonate are added to the desired quantity and the ingredients mixed thoroughly. Water is added slowly and the dough formed. Vigorous kneading is necessary. The dough is rolled into lengths and cut into uniform pieces to be placed in the flattening machine. On pressing the foot operated pedal, the dough is flattened to the desired thickness, shape, and size. The excess dough is removed and recycled once again. The papad are dried in a current of cold air to a moisture content of 12%. Excessive drying is avoided to prevent brittleness and cracking. The papads are then packed by weight or numbers.

2.2.1. Raw material

Black gram dhal flour, salt, Sodium bicarbonate, Water potable, crushed cumin seed and black pepper, asafoetida, Ca-propionate.

2.3. Processing technology of papad making is given below:

2.3.1. Cleaning of Black gram

Black gram received at the mill needs to be cleaned for yielding good quality flour with higher recovery. Usually, two, types of cleaners are used: reciprocating air-screen cleaners and reel screen cleaners. In reciprocating air screen cleaners air is blown through two screens (sieves) which separate out lighter material such as dust, stalk, dried leaves, husk, etc. The upper screen has bigger perforations while the second screen has smaller perforations for final cleaning. The reel screen cleaners consist of 2-4 cylindrical compartments. The frame of the machine is made of wooden or mild steel sheet. In these compartments, different size perforation screens are fitted on a 5-7.5 mm diameter shaft. The cylindrical screen drum rotates at 5-35 rpm.

2.3.2. Drying

Drying of pulses (Black gram) is necessary to ensure safe storage before milling as pulses received at the mill have generally higher moisture content. Sun drying of pulses is an economical option for drying of pulses. The sun drying is done for 1-6 days as per the requirement. The black grams are spread over the floor/roof in a 5 to 7.5 cm thick layer which is intermittently stirred manually with the help of rakes or turning by foot. At night, the drying pulses are collected in heaps and covered with a canvass sheet to preserve the heat. Mechanically heated air dryers, either batch type or continuous flow type are also used by the millers. The temperature of heated air for drying varies from 60⁰ to 120⁰ C.

2.3.3. De-hulling

Removal of the seed coat is beneficial for the following reasons:

- Reduces anti-nutritional factors, such as tannins and insoluble fiber (non-nutrients that can bind protein and other nutrients), thereby improving nutritional quality, protein digestibility, texture and palatability.
- Removes astringent taste caused by tannins.
- Allows the production of higher quality flours, without browning/speckling (also increases leavening ability).

2.3.4. Grinding of Black gram

The production of flours involves grinding whole or dehulled seeds/dhal into small particles. To obtain a flour of more uniform particle size, ground particles are passed through one or more screens.

2.3.5. Mixing of ingredients

For the papad preparation the black gram flour is mixed with other ingredients salt, Sodium bicarbonate, Water Potable, crushed cumin seed and black pepper, asafoetida, Ca-propionate etc. In Appropriate quantity.

2.3.6. Kneading of the dough

Kneading is a process in the making of papad, Its importance process in the mixing of flour with water and used to mix the ingredients and add strength to the final product. Kneading can be performed by forming and kneading machine.

2.3.7. Shaping

The papad press is machinery operated. The papad dough is made from pulse flour (preferably urad dal), slat, carbonates, farinaceous material and water.

The dough is made into sheet form by press machine into 1-mm thickness and cut into circular shape by machine. The pressed circular shaped papad is dried to 14-15% moisture level at room temperature using dryer machine.

2.3.8. Packaging

The papad with a 14-15 % moisture level is packed in polythene sheets using a hand sealing machine and sent to the market after final packaging

2.4. Equipment Involved

2.4.1. Plate grinder: this machine is used for grinding the pulses (Black gram) in a very fine size. It comes with grinding equipment, screening equipment, and flour purifier.



2.4.2. Sieve shaker: Sieve shakers are used for the separation and size determination of particles of pulses flour. A typical sieve shaker separates particles by passing them through a series of chambers with mesh filters and agitating the sample in order to obtain a complete separation.



2.4.3. Low pressure boiler: Most commonly low-pressure boilers are used for comfort heating, humidification, and for some lower temperature process applications. Steam boiler technology is used for a wide range of applications. Low-pressure steam boilers are limited to 15 PSIG design and are commonly used for heating applications.



2.4.4. Steam jacketed kettle with stirrer: Steam jacketed kettle with a stirrer is a well-designed machine available to simplify various commercial as well as household food processing chores. The steam jacketed kettle with a stirrer is generally used to process raw materials without hampering its quality.



2.4.5. Motorized mixing: It automates the repetitive tasks of stirring, whisking, or beating. When the beaters are replaced by a dough hook, a mixer is used to knead the flour.



2.4.6. Papad making machine: This machine is used for the shaping of the dough in sheet form and cutting into a circular shape as a papad.



2.4.6. Hand impulse sealer: An impulse sealer is a powered tool used to seal different types of plastic packaging most often poly bags containing groups of parts or components. It uses an impulse of electricity to heat up a metal wire that melts one layer of plastic to the other.



2.5. PROJECT COMPONENTS

Land

The required land for papad manufacturing is estimated to be around 1500Sq.ft.

Civil Work

- **Workshop Area-** This area includes the space for processing, cleaning, sorting and, processing, packaging processes. Total workshop area is approx. 800 Sqft.
- **Inventory Area-** This area includes the storage space for all the raw materials and storage space and finished goods. Total inventory area is approx. 300 Sqft.
- **Office Area** – This space includes staff working region. Total workshop area is approx. 300, Sqft. (Land and building requirement may vary depending on the size of project)

Misc. Assets

- Water Supply Arrangements
- Furniture
- Computer and Stationary
- Laboratory for testing

Power Requirement

With semi-automatic machines and equipment with manual handling, the Power Required is about: 10 kW, to operate this plant. (It is also depend on Project size and machines specification)

Manpower Requirement

For a small unit to begin with around 8-10 people can work.

CHAPTER 3

Packaging of Papad

3.1. Deteriorating factors

In order to select a suitable packaging material/ type of package for Papad, it is essential to know the factors which affect the quality of Papad.

3.1.1. Moisture Content

Papad is hygroscopic in nature and picks-up moisture from the atmosphere resulting in high moisture in the papad. Pick-up of moisture also results in loss of the shelf life of the papad.

3.1.2. Loss of Aroma / Flavour

Papad contains some aroma, which imparts the characteristic aroma/ flavor to the product. Oxidation of some aromatic compounds results in aroma and flavor loss.

3.1.3. Discolouration

Light can affect the papad Quality resulting in loss or fading of colour and deterioration of Papad.

3.1.4. Insect Infestation

Papad is prone to spoilage due to insect infestation, which can be further accelerated due to high humidity, heat, and oxygen.

3.1.5. Microbial Contamination

In high humidity condition of 65% and above, moisture absorption occurs. Beyond a certain level of moisture content, spoilage due to microbial growth sets in.

3.2. Packaging requirements of papad

In order to maintain the quality of the Papad during handling, transportation, storage and distribution, the packaging material to be used is to be selected with care, keeping in mind the functional as well as the marketing requirements.

The packaging requirements for Papad, in general, are listed below:

- To protect the product from spillage and spoilage.
- To provide protection against atmospheric factors such as light, heat, humidity and oxygen. The selected packaging materials should have high water vapour and oxygen barriers.
- The packaging material should have a high barrier property to prevent aroma/flavour losses and ingress of external odour.
- The volatile oil present in papad due to spice, it has a tendency to react with the inner/ contact layer of the packaging material, at times leading to a greasy and messy package with smudging of the printed matter. The packaging material should therefore be grease and oil resistant and compatible with the product.
- Besides the above functional requirements, the packaging material should have good machinability, printability and it should be easily available and disposable.

3.3. Packaging materials for Papad

3.3.1. Bulk packaging

In bulk packaging, the current trend is to use Flexible Intermediate Bulk Containers (FIBCs) commonly known as Jumbo bags. These bags have a capacity of up to 100 kg for Papad. In general, these bags are made from cloth, but at present mainly from plastic (PP) fabric, which can be laminated or provided with an inner plastic liner bag. The PP fabric is stabilized against UV degradation. The bags are provided with filling and discharge spouts and slings for hanging during loading/ unloading operations.

The FIBCs offer various advantages such as:

- Bags are flexible, collapsible, and durable.
- Product wastage/spillage and tampering can be avoided.
- Since the handling is mechanized, less labor is required.
- Saving in time for loading and unloading.
- Bags are light in weight and, therefore, freight costs are reduced.

3.3.2. Institutional packages

Institutional packs of capacities ranging from 2kg to 10kg are also used. The traditional materials that were used such as tinsplate containers and jute bags are currently being replaced by materials such as laminated flexible pouches and plastic woven sacks. The sacks are usually BOPP multicolor Printed laminated PP Woven bags. These bags may be gusseted and have a window and micro-perforation.

3.3.3. Consumer Packages

The options available to the traders/exporters of Papad in the selection of a consumer pack for domestic and export market are quite wide. However, the selection/choice of the packaging material/ system depends upon a number of factors, which are broadly listed below:

- Shelf-life period i.e. the degree of protection required by the product against moisture pick-up, aroma retention, discolouration etc.
- Climatic conditions during storage, transportation and distribution
- Type/ sector of market
- Consumer preferences
- Printability and aesthetic appeal

The package types generally used as consumer packs are:

- Glass bottles of various sizes and shapes with labels and provided with metal or plastic caps. The plastic caps have added inbuilt features of tamper evidence, dispensing, grinding etc.
- Printed tinsplate container with/without dispensing systems
- Composite containers with dispensers
- Plastic containers with plugs and caps with dispensing and tamper evidence features
- Printed flexible pouches – pillow pouch, gusseted pouch, stand-up pouch.
- Lined cartons.

The printed flexible pouches have recently become very popular due to their easy availability, excellent printability, light weight, machinability and cost-effectiveness. Also,

depending upon the functional and marketing requirements, the laminate/film can be tailor made to serve a specific need.

The printed flexible pouches are generally laminates of various compositions. Some of the commonly used laminates are:

- Polyester/ metallised polyester/LDPE
- BOPP/LDPE
- BOPP/ metallised polyester/LDPE
- Polyester/Al foil/LDPE

3 ply laminates such as 12 μ PET/ Print/ 12 μ Met. PET/ PE can avoid delamination and prevents smudging and de-figuring of the print.

Polyester and BOPP based laminates are generally more popular for spice packaging due to certain advantageous characteristics of each of these two films.

Polyester used for lamination is generally 10 or 12 μ thick. The film is highly transparent with excellent clarity, gloss and printability thus enhancing the sales appeal. The film has very low moisture and gas permeability and, therefore, ensures prolonged shelf life of the contents with aroma, flavour and taste retention. The very high mechanical strength (tear, puncture, burst and flex) minimises damage to the contents during handling and transportation. The film has good machinability as well as printability. The latest printing technologies help in improving sales promotions. The film is free from additives and, therefore, does not impart any odour or taint to the sensitive spice product that is packed.

BOPP films may be heat sealable or non-heat sealable. The film has high yields, is stable under climatic changes and has excellent moisture barrier. This film is smooth, glossy, crystal clear and has high mechanical strength and non-contamination property for food contact applications.

The following table shows the packaging specifications for flexible packs of snacks, framed by the Indian Institute of Packaging.

Laminates/Co-extruded films (up to 500 grams capacity)	Laminates/Co-extruded films (up to 1000 grams capacity)
12 μ PET / 37.5 μ LD-HD (30% HD)	12 μ PET/50 μ LD-HD (30% HD)

12 μ MET PET / 37.5 μ LD-HD (30% HD)	12 μ MET PET / 50 μ LD-HD (30% HD)
12 μ PET / 50 μ PP	12 μ PET / 62.5 μ PP
12 μ MET PET / 50 μ PP	12 μ MET PET / 62.5 μ PP
10 μ PET / 9 μ Al. foil / 37.5 μ LD-HD (30% HD)	10 μ PET / 9 μ Al. foil / 50 μ LD-HD (30% HD)
12 μ Al. foil / 37.5 μ LD-HD (30% HD)	12 μ Al. foil / 50 μ LD-HD (30% HD)
25 μ BOPP / 37.5 μ LD-HD (30% HD)	25 μ BOPP / 50 μ LD-HD (30% HD)
25 μ MET BOPP / 37.5 μ LD-HD (30% HD)	25 μ MET BOPP / 50 μ LD-HD (30% HD)
35 μ BOPP / 25 μ BOPP	35 μ BOPP / 35 μ BOPP
30 μ LD – 7.5 μ Tie - 25 μ PA – 7.5 μ Tie - 30 μ LD-HD (30% HD)	30 μ LD – 7.5 μ Tie - 30 μ PA – 7.5 μ Tie - 40 μ LD-HD (30% HD)
The LD or LD-HD layer could also be LLD (outer) or LLD-HD (inner or outer) or EAA layer (outer)	The LD or LD-HD layer could also be LLD (outer) or LLD-HD (inner or outer) or EAA layer (outer)

The types of sealing of pouches from flexible plastic based materials could be variable:

- Centre seal formation
- Three sides seal formation
- Four sides seal formation
- Strip pack formation

The vital link in the performance of the pouch is the seal integrity. The performance of the heat seal layer is very important. Even if the film structure has been designed with exceptional properties, with excellence in interlayer lamination, if the sealing of the pouch fails, the product may get contaminated and in some cases become unfit for consumption.

CHAPTER 4

Food Safety Regulations & Standards

According to the FSSAI standards, Papad means the Pulses based Product made by grounded Pulses flour.

4.1. The FSSAI standards of Papad:

(i) Moisture	Not more than 14.0 per cent by weight
(ii) Foreign matter -Extraneous Matter	Not more than 1 per cent. by weight of which not more than 0.25 per cent. by weight shall be mineral matter and not more than 0.10 per cent by weight shall be impurities of animal origin
(iii) Other edible grains	Not more than 4 per cent by weight.
(iv) Damaged grains	Not more than 5 per cent by weight
(v) Weevilled grains	Not more than 6 per cent by count.
(vi) Uric acid	Not more than 100 mg per kg
(vii) Aflatoxin	Not more than 30 micrograms per kilogram
It is also Provided that the total of foreign matter, other edible grains and damaged grains shall not exceed 9 per cent by weight.	

Explanation — For the purposes of items in regulation 2.4.6 (2-14):—

(a) "**foreign matter**" means any extraneous matter other than food grains comprising of-

(i) inorganic matter consisting or metallic pieces, sand, gravel, dirt, pebbles, stones, lumps of earth, clay and mud, animal filth and in the case of rice, kernels or pieces of kernels, if any, having mud sticking on the surface of the rice, and

(ii) **Organic matter** consisting of husk, straws, weed seeds and other inedible grains and also paddy in the case of rice;

(b) poisonous, toxic and/or harmful seeds - means any seeds which is present in quantities above permissible limit may have damaging or dangerous effect on health, organoleptic properties or technological performance such as dhatura (*D. fastur linn* and *D. stramonium linn*), corn cokle (*Agrostemma githago L*, *Machai Lallium remulenum linn*), Akra (*Vicia species*).

(c) "Damaged grains" means kernels or pieces of kernels that are sprouted or internally damaged as a result of heat, microbe, moisture or whether, viz., ergot affected grain and kernel bunt grains;

(d) "Weevilled grains" means kernels that are partially or wholly bored by insects injurious to grains but does not include germ eaten grains and egg spotted grains;

(e) "Other edible grains" means any edible grains (including oil seeds) other than the one which is under consideration.

4.2. Food Additives for use for Rice and Pulses based Papads:

- Sorbic acid and its sodium, potassium and calcium salts (calculated) as sorbic acid should not be more than 0.1%

Soups, Bullions, and Taste Makers: Soups, Bullions, and Taste Makers Di-Sodium 5 Guanalate (Disodium 5- Inosinate) GMP.

The Microbial standards for Papad are as follows:

S.No	Parameter	Requirements
1.	Total Plate Count	-
2.	Coliform Count	-
3.	E.Coli	-
4.	Salmonella	Absent in 25gm
5.	Shigella	-
6.	Staphylococcus aureus	-
7.	Yeast and Mould Count	-

8.	Anaerobic Spore Count	-
9.	Listeria monocytogenes	-

4.3.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.



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