



PM Formalisation of Micro Food Processing Enterprises Scheme

Processing of Meat Seekh Kabab



AATMANIRBHAR BHARAT

**National Institute of Food Technology, Entrepreneurship and
Management (NIFTEM) - Thanjavur**

(an Institute of National Importance under Ministry of Food Processing Industries, Government of India)

Pudukkottai Road, Thanjavur – 613005

<https://niftem-t.ac.in/>

Ph : 04362-228155, Fax:04632-227971

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CHAPTER 1

INTRODUCTION

1.1 ABOUT MEAT

Meat is the flesh of animals that humans prepare and consume as food. In many countries, the term mainly refers to the muscle tissue of mammals and birds. It's typically consumed as steak, chops, ribs, or roast, or in ground form. Meat is considered as highly nutritious and has become an integral component of human diet being a rich source of valuable proteins, vitamins, minerals, micronutrients and fats. Today, most meat worldwide comes from domesticated animals raised on farms, mainly large industrial complexes that often house thousands of animals at a time.

In India, livestock plays a significant role, and poultry and dairy are the major sectors contributing to economic development. In Indian context, culture, traditions, customs, and taboos influence meat consumption to a great extent, in particular, is determined by the religions in India. The consumption of meat in India is increasing. The studies show that urbanization has been causing a rise in demand for meat products. The majority of meats consumed are fish, bovine, mutton, goat, pig, and poultry. Meat consumption is supposed to supply omega 3 fatty acid and conjugated linoleic acid that affords multifaceted nutrient for human health.

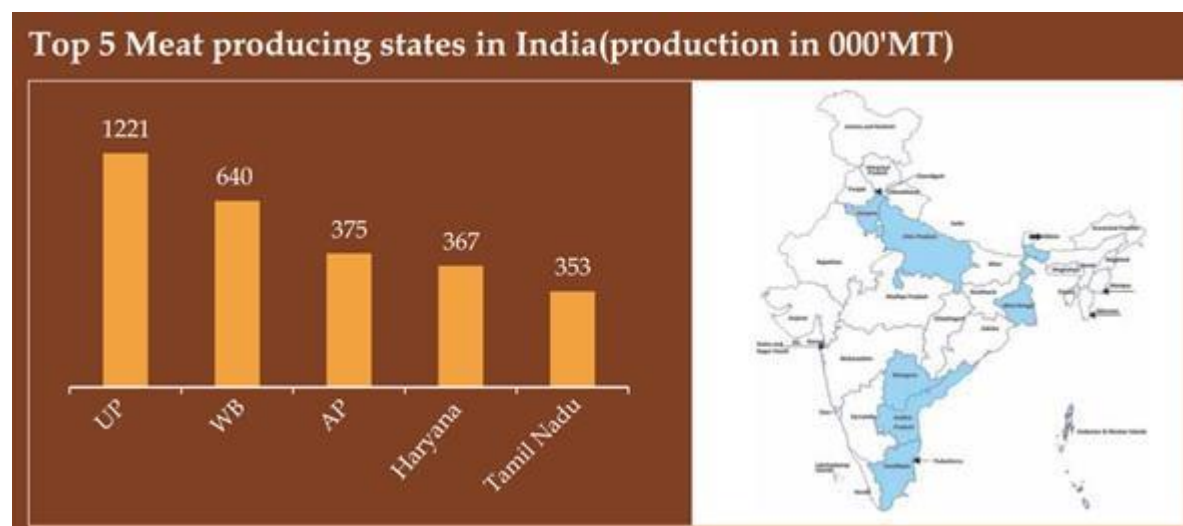


Consumer Preference for Meat

In India, 95% of goat meat produced is consumed locally. Among the various meats consumed in India, chicken and fish have the highest consumption rate per capita, according to a National Sample Survey conducted in 2012. According to the study, a non-vegetarian diet, especially fish and other seafood, is most common in the coastal regions in India. The preference and consumption of chicken meat can be considered as a universal phenomenon and chicken meat is greatly accepted by consumers in India as compared to the other meat consumption. The increase of chicken meat consumption is due to the versatility of the meat, relatively low cost in comparison to other meat, and the acceptance of the chicken meat to all religions, greater exposure to newer cultures, and increasing disposable incomes. There has been a great rise in the production of livestock products and this is expected to continue in the future. According

to the Department of Animal Husbandry, there are 2.3 billion broiler chickens, 135 million goats and sheep, and 3.3 million cattle slaughtered for their meat every year in India alone. However, the pattern of meat consumption depends considerably on culture, tradition and urbanization.

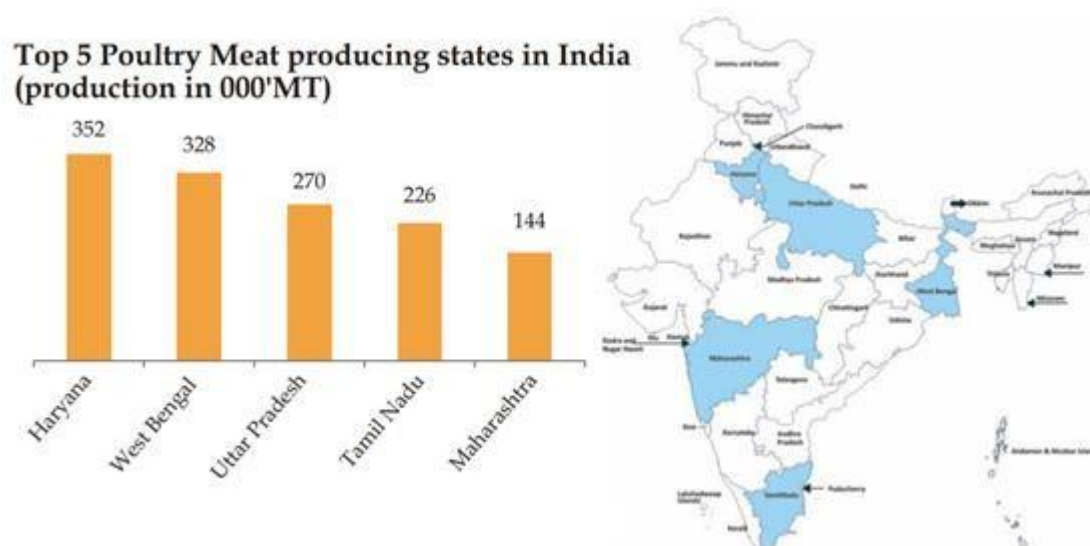
1.2 MEAT PRODUCTION IN INDIA: AT A GLANCE



Source: Department of animal Husbandry, dairying and Fisheries (DADH) 2017

The largest producer of meat in the country is Uttar Pradesh producing 23% of the total meat followed by West Bengal contributing 12% to the meat production. Andhra Pradesh is the third largest meat producer in the country which produces 7% of the total production.

Poultry Meat



Source: Department of animal Husbandry, dairying and Fisheries (DADH) 2017

Haryana, West Bengal & Uttar Pradesh are the leaders in poultry meat production in the country.

EXPORT (2019-20)

Product Name	Qty	Rs Crore
Processed Meat	442 MT	15.25
Buffalo Meat	1152324	22661
Other Meat	1052	16.57
Sheep/Goat Meat	14368	654

Source: DGCIS

1.3 TYPES OF MEAT PRODUCED IN INDIA

Buffalo Meat

The major areas for Buffalo Meat production are Uttar Pradesh, Andhra Pradesh, Maharashtra and Punjab. The country has exported 11,52,547.32 MT of buffalo meat products to the world for the worth of Rs. 22,668.48 Crores/ 3,175.05 USD Millions during the year of 2019-20. (Source: APEDA)

Major Export Destinations (2019-20): Vietnam Soc Rep, Malaysia, Egypt A Rp, Indonesia, Iraq. (Source: APEDA)

Sheep and Goat Meat

Goats - Sheep constitute a very important species of livestock in India, mainly on account of their short generation intervals, higher rates of prolificacy, and the ease with which the goats as also their products can be marketed.

Rajasthan, Jammu & Kashmir, Uttar Pradesh, Gujarat, Hilly regions of North and Eastern Himalayas are the Indian regions with maximum livestock population.

India is largest exporters of Sheep & Goat meat to the world. The country has exported 14,128.85 MT of sheep & goat meat to the world for the worth of Rs. 646.69 Crores/ 90.77 USD Millions during the year 2019-20. (Source: APEDA)

Major Export Destinations in 2019-20: United Arab Emirates, Qatar, Kuwait, Saudi Arab, Oman. (Source: APEDA)

Other Meat

Other Meat constitutes a very important species of livestock in India. They are considered to be very important for their contribution to the development of rural zones and people. Other meat includes that of Horses, Swine/Pigs, rabbits, Camel, Primates etc.

The major areas for Swine/pig Meat production are Uttar Pradesh, Bihar, and Maharashtra India is also the largest exporters of other meat to the world. The country has exported 1,030.41 MT of other meat to the world for the worth of Rs. 16.32 crores/ 2.27 USD Millions during the year 2019-20. (Source: APEDA)

Major Export Destinations (2019-20): Bhutan, Vietnam Soc Rep, Myanmar, Nepal, Liberia.
(Source: APEDA)

Processed Meat

The total processing capacity in India is over 1 million tons per annum, of which 40-50 percent is utilized. India exports about 18,95,497.05 tons of Animal Products, mostly buffalo meat. Indian buffalo meat is witnessing strong demand in international markets due to its lean character and near organic nature. Goat and lamb meat are relatively small segments where local demand is outstripping supply.

Andhra Pradesh, West Bengal, Maharashtra, Kerala, Delhi, Uttar Pradesh, Rajasthan are the key areas of Processed meat production in India

India has exported 439.60 MT of processed meat to the world for the worth of Rs. 14.71 Crores/ 2.03 USD Millions during the year 2019-20. (Source: APEDA)

Major Export Destinations (2019-20): Myanmar, United Arab Emirates, Thailand, Qatar, Bhutan (Source: APEDA)

1.4 HEALTH BENEFITS OF MEAT

Complete natural protein

Protein found in meat and poultry is “complete” because it contains all the amino acids essential for health. Animal proteins are complete proteins and they occur naturally – no protein powder needed.

Iron rich

Meat, fish and poultry contains heme iron, which helps to prevent anaemia because the body absorbs this iron better than non-heme iron found in plant foods such as vegetables. Heme iron foods help the body absorb non-heme iron.

Bioavailable nutrition

Nutrients in meat, including iron and zinc are typically more easily absorbed and used by the body.

Muscle strength and maintenance

High- quality protein, e.g., meat and poultry, have been shown to prevent muscle loss as we age more effectively than other protein foods.

Bone strength

Meatless diets have been shown to contain lower amounts of calcium, vitamin D, vitamin B-12, protein, and omega-3 fatty acids, which have important roles in maintaining bone health.

Brain function

Animal products like meat are the only natural sources of Vitamin B12, which promotes brain development in children and helps your nervous system function properly.

Blood Sugar Control

A high protein and low carbohydrate diet, which could include lean meat and poultry, can help to control blood sugars.

Zinc immunity

Zinc helps maintain optimal immune function and promotes wound healing. Beef is the top dietary source of zinc in the diet.

Selenium-rich

A serving of beef or lamb delivers half a human's daily selenium needs. Selenium is an antioxidant that helps prevent cell damage, promotes proper thyroid function, and may contribute to cancer prevention.

Weight management

High protein diets that include lean meat and poultry have been shown to promote long term weight loss better than other diets.

Nutritional content

Sl. No.	Nutrient	Amount(/100g)
1.	Calories	143 kcal
2.	Protein	26 g
3.	Fat	3.5 g
4.	Iron	1.2 mg
5.	Sodium	57 mg
6.	Potassium	421 mg

(Source: USDA)

1.5 SEEKH KEBAB

It is a type of kebab, popular in South Asia, made with spiced minced or ground meat, usually lamb, beef, or chicken, formed into cylinders on skewers and grilled. It is typically cooked on barbecue, or in a tandoor. Sometimes extra fats are added to further enhance the flavour. This delicacy has been made available outside restaurants in the form of Frozen/Pre-Cooked/Ready-to-eat Seekh kebab which can be consumed at one's convenience at home. These can be eaten as a snack with cold beverage or as a regular meal along with other side dishes, as per liking. With increasing demand of processed meat products, Seekh kebab has become one of the most popular meat products among consumers. Not only giant multinationals are processing them at large level, many small industries are also producing seekh kebab at small scale to meet the high demand, domestically as well as abroad.



CHAPTER 2

PROCESSING OF MEAT FOR SEEKH KEBAB

2.1 INGREDIENTS USED

- **Frozen meat (Chicken/ Beef/Mutton)**
- **Soy granules/flakes-** These are known as Meat extenders and they are primarily plant proteins from legumes, with soybeans as the major source. Textured Vegetable Protein is the most common soy bean extender. It is used to increase the volume of the product.
- **Ice-** Dry Ice will keep the temperature cold and reduce spoilage while processing meat. This is used in industrial processing of ground meats and sausages.
- **Flavouring/ Spices mix-** Seasonings are normally parts of plants which flavour food. Natural spices, herbs and vegetable bulbs are the main groups of seasonings used.
- **Phosphate salt -** Phosphate salts are used for improving the water holding capacity (to improve water retention) of meat, stabilizing the texture, emulsification of fat, slowing down oxidation reactions, reduce shrinkage (moisture loss) during cooking and to enhance flavour, colour and appearance.

2.2 PROCESSING

Frozen Meat Block Cutting

Meat (along with Chicken skin) is generally frozen at -18 to -12 degree Celsius before cutting into small blocks. Cutting boneless meat which is frozen and without thawing is generally done to avoid nutrition losses, saves flavour and cause minimum wastage and spill. For this purpose, Frozen meat cutter or saw band is used. Cutting through saw band not only preserve meat's freshness but also it does not damage the muscle fibres.

Mincing

It refers to a technique in which meat is crushed into very small pieces. This approach is popular especially when it comes to preparing meat for processing into different products such as meat patty, kebabs etc. For seekh kebab, the meat is minced to the size of 3mm.

Chopping and Mixing of Ingredients

After mincing, chopping or emulsifying of all the ingredients are done in order make a mixture of uniform consistency. This step basically shreds all the ingredients which are to be used in the kebab mixture. For this, a buffalo chopper, also known as a bowl chopper or food cutter, which is a machine that chops or emulsifies food by rotating it in a bowl under spinning blades. Because buffalo choppers' bowls are shallow, they help to promote even cutting and prevent the ingredients from piling up during rotation.

Shaping/Filling

Seekh kebabs are long cylindrical in shape. This shape gives seekh kebab its peculiar name as traditionally it was shaped and cooked on iron rod/ skewers on charcoal fire. To imitate the same shape and size in small- and large-scale industries, Hydraulic filling machine is used which ease up the shaping process.

Cooking/Roasting

Roasting is a cooking process that involves applying dry heat indirectly. Roasting meat is typically done at a high temperature for a short period of time, which is used to caramelize the outside of the meat, tenderizing the meat through. Seekh kebabs are roasted at temperature 220 degree celsius, with humidity 80% for 12 minutes to get desirable colour and softness. For this step, Combi oven is used which uses the combination function of both steam and convection to work together to produce kebabs that are moist, flavourful, and have minimal shrinkage. After cooking process, the long seekh kebabs are cut into smaller sizes according to packaging requirement to make weighing convenient.

Vacuum Packaging

It is a method of preserving foods by preventing contact with oxygen - which is required by pathogenic and food spoilage microorganisms in order for them to live and multiply. Vacuum packing sucks air out of food packaging so that there is no air around the food. It is especially suited for packaging of Seekh kebabs. Vacuum packing can be achieved with the use of a commercially available vacuum sealer.

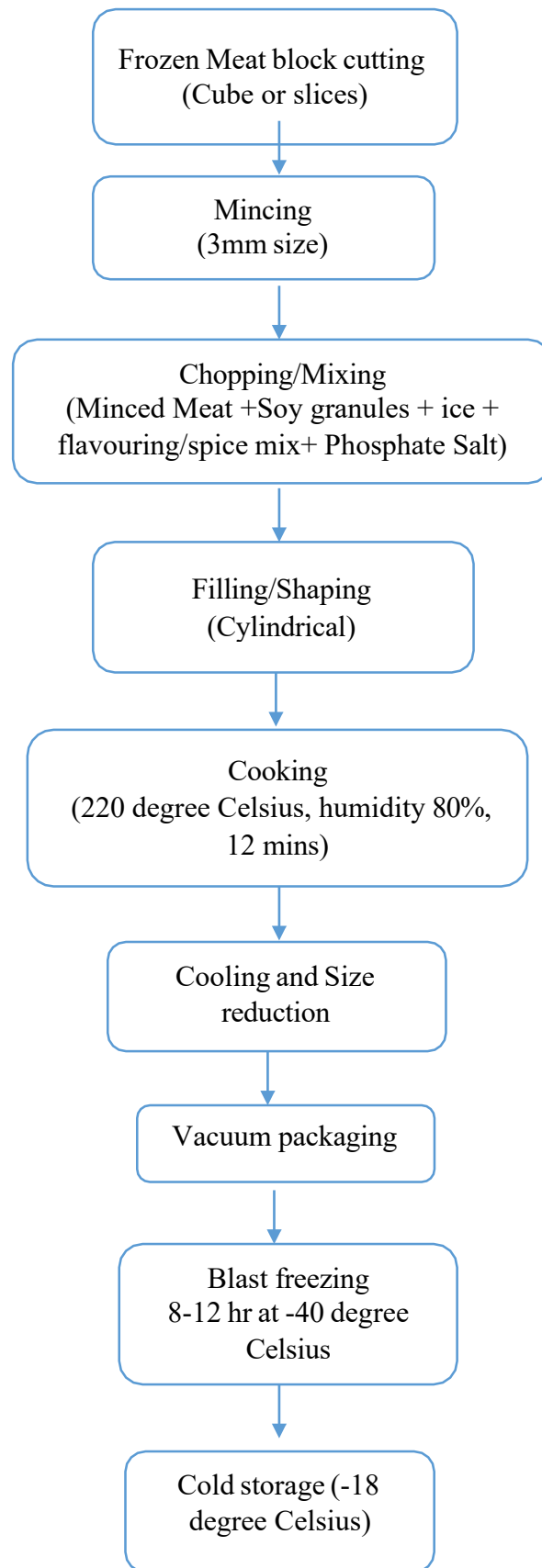
Blast Freezing

During freezing, the longer the freezing process takes, the larger the ice crystals. Larger ice crystals damage materials by causing phenomena like cell bursting, which affects quality and flavour of foods. Therefore, blast freezing is used which causes the crystals formed to be very small and it does less damage and preserves food at a higher quality. Blast freezing of Seekh kebabs is done for 8-12 hr at -40 degree Celsius.

Cold Storage

After blast freezing, the packets are wrapped into tertiary packs and then are shifted to cold store which is at -18 degree Celsius till further delivery to the clients.

2.3 FLOW CHART



2.4 MACHINES USED

1. Meat Band Saw



2. Meat Mincer with plates



3. Bowl Chopper



4. Combi Oven



5. Filler Machine



6. Vacuum Packaging Machine



7. Metal Detecting Machine



8. Blast Freezer



9. Cold Storage



CHAPTER 3

PACKAGING

3.1 PURPOSE OF PACKAGING

The basic purpose of packaging is to protect meat and meat products from undesirable impacts on quality including microbiological and physio-chemical alterations. Packaging protects foodstuffs during processing, storage and distribution from:

- contamination by dirt (by contact with surfaces and hands)
- contamination by micro-organisms (bacteria, moulds, yeasts)
- contamination by parasites (mainly insects)
- contamination by toxic substances (chemicals)
- influences affecting colour, smell and taste (off-odour, light, oxygen)
- loss or uptake of moisture (evaporation or water absorption)

A range of synthetic materials suitable for meat packaging are available mainly in the form of plastic films or foils. Packaging films must have following qualities:

- flexible
- mechanical strength
- light weight
- odourless
- hygienic (clean and toxicologically harmless)
- easy recycling
- resistance to hot and cold temperatures
- resistance to oil and fats
- good barrier properties against gases
- sealing capability
- low-cost

3.2 PACKAGING REQUIREMENTS FOR SEEKH KEBAB

1. Barrier against gases

Good barrier properties against oxygen and evaporation are the most important features in order to ensure:

a) Exclusion of oxygen

Oxygen changes the red meat colour to grey or green and causes oxidation and rancidity of fats resulting in an undesirable off-flavour. The best protection will be achieved using oxygen-proof packaging films together with vacuum packaging of the product.

b) Prevention of evaporation of product moisture

Fresh meat or fresh sausages or freshly processed meat products have a comparably good amount of moisture content and will suffer considerable weight and quality losses by

evaporation and drying during storage, if such products remain unpacked. The packaging material must therefore be sufficiently water-vapour-proof.

2. Barrier against light

The prolonged exposure to daylight or artificial light accelerates unattractive colour changes, oxidation and rancidity. Transparent packaging films normally allow attractive product presentation as the packaged product is visible. However, no protection against light impact. Therefore, for light sensitive products or products exposed to strong light, coloured or opaque films should be used. Films laminated with aluminium foil are very effective.

3. Sealing capability (Thermoplastic properties)

The films must be heat sealable, i.e., under slight pressure and with simultaneous high temperature application, they will melt or seal together along the heated area, resulting in hermetically closed plastic pouches or bags. Opaque and printed films are used as light barrier.

3.3 PACKAGING MATERIAL FOR SEEKH KEBAB

PRIMARY PACKAGING

- Envelops and holds the product.
- Direct contact with the kebabs.



Types of packaging films which can be used for primary packaging

For the various purposes in the meat industry packaging films can be divided into Single-layer films and Multi-layer films.

Single-layer films

It is used for wrapping of meat pieces bone-in or boneless meat cuts or even entire carcasses as well as few processed meat products. These are self-adhesive, i.e., they cling together - “cling film”- in the overlapping areas. They provide good protection from external contamination and to some extent from evaporation but no protection from oxygen, as they are not hermetically closed or sealed packages. Foils with good self-adhesive properties are PE, PA, PVC and PP. To avoid evaporation, ice formation and freezer burn during freezer storage, at non-contact spots, suitable cold resistant films for freezer storage used are PA or PE.



Multi-layer films

Multi-layer barrier film packaging saves the processed meat product from rotting by dust, parasitic organisms, bacteria and poisonous objects, from formulating odd smell, shade and flavour and from putting or adding up the water content. The fact is that there are bacteria already within the meat and to assure their supplementary growth or to destroy them entirely, certain subtractive processes are needed to be featured collectively with packaging, for instance refrigeration for ceasing or slowing the development of the sterilization and pathogens or heating for excreting the bacteria. In general, the internal multi-layer meat packaging is carried out where the barrier material comes in quick contact with the meat.

Practically all the other films used for meat packaging are designed as strong oxygen and water-vapour barriers. In order to fully achieve these requirements, films with good barrier properties for oxygen and water vapour respectively are combined.

For Instance, Layer1: Outside layer (mechanically strong, gas barrier to oxygen)

Layer 2: Middle layer (barrier to oxygen)

Layer 3: Inside layer = sealant layer (capable of being melted and welded under pressure to the sealant layer of the opposite sheet of the bag/pouch, serves also as barrier to water vapour).



Combinations for Multiple layer films

A very efficient combination used is Polyamide (PA)/Polyethylene (PE). PA is relatively oxygen proof but permeable to some extent to water vapour. PE has the opposite properties; it is water vapour proof but permeable to oxygen. Moreover, the PE used as the inside layer has good thermoplastic properties and is therefore well suited for heat sealing. Sealant layers consist mostly of Polyethylene (PE) or Ionomer (I). Outside layers may be Polyamide (PA), Polyester (PET) or Polypropylene (PP). Barrier layers for oxygen are made of Polyvinylidenechloride (PVDC) or materials with similar properties.



SECONDARY PACKAGING

- Used to group the primary packages
- Present outside the primary unit



TERTIARY PACKAGING

- Used for handling of bulk during storage and transport.
- Carton palletized unit of secondary package. Package for any product is selected based on their characteristics and stability



3.4 PACKAGING TECHNIQUE

Vacuum packaging (VP) along with refrigeration, have become increasingly popular preservation techniques to extend the shelf life of meat and meat products, which have brought major changes in storage, distribution, and marketing of raw and processed meat products.

Vacuum packaging (VP) is the packaging of a product in containers (rigid or flexible), from which air has been substantially removed before final sealing (Muller, 1990). Refrigerated processed meats like sausages, hot dogs and restructured ham products, and other sliced processed meats are traditionally vacuum-packed in plastic packages to minimize contact of the product with the oxygen and consequently prolong their shelf life.

VP materials

Vacuum packages for retail meat products are generally low-oxygen packaging systems in which the meat is in a barrier styrene or PE films and the heat-shrinkable barrier films are vacuum sealed to conform to the shape of the product. Common materials for vacuum packaging include PA, EVA, EVOH and PET-PVdC. It should be noted that the reduced thickness at the corners of the package significantly affects the gas barrier properties of the vacuum package. Oliveira et al. (2006) suggested the use of EVOH in vacuum packaging because this material does not affect the gas barrier properties of the packaging corners. Currently, a typical VP material is usually a three-layered co-extrusion of EVA/PVdC/EVA with O₂ permeability of less than 15.5 ml m⁻² (24 h)⁻¹ at 1 atmosphere. A variation of the VP system is using composite films with outer barrier and inner air-permeable layers.

Vacuum Packaging Machine



A vacuum packaging machine puts product in a film bag, de-aerates the bag by decreased pressure in a vacuum chamber, and seals the bag. It prevents discoloring of product and heightens display effect.

Only by placing a product in bag on a belt, the machine automatically fulfills series of vacuum packaging processes from vacuum-packaging, sealing, cooling and discharging.

For meat processing industries, vacuum packaging machine wraps food with freshness intact. When the package is opened, the original taste and flavour is retained.

Metal Detector Machine



In the food processing industry, metal is one of the most commonly found contaminant materials in food. Metal can be introduced at all stages of processing of meat, as it is most commonly used in the construction of machinery, handling equipment and ancillary utensils. A metal detector for the food industry can help ensure the safety and integrity of a wide range of unpackaged, packaged or bulk goods, by identifying metal contaminants during processing or packaging.

CHAPTER 4

FSSAI FOOD REGULATIONS AND STANDARDS

4.1 Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011

Regulation 2.5.2 Meat and Meat Products:

Cooked or Semi-Cooked Meat Products

The standards specified in this clause shall apply to cooked or Semi-cooked meat products which includes cooked (including cured and cooked) and heat treated meat products.

Cooked meat means the meat or meat product subjected to heat treatment, wherein minimum thermal core temperature of 75 degrees centigrade is achieved.

These products may contain only those ingredients which are either standardised or permitted for use in the preparation of other standardised food under these regulations and includes but not limited to the following ingredients, namely: -

1. Common Salt (Sodium chloride or potassium chloride), or salt substitutes (including nitrites).
2. Carbohydrate and protein binders such as, -
 - (i) milk powders, caseinate, whey powder, egg protein, vegetable protein products;
 - (ii) meal, flour, fibres or starch prepared from grain, or potato or sweet potato;
 - (iii) bread, biscuit or bakery products;
3. Sucrose (sugar and brown cane sugar), dextrose (glucose), lactose, maltose, glucose syrup (including corn syrup);
4. Fats;
5. Vegetables;
6. Cereal and cereal products;
7. Herbs, Spices, seasonings and condiments;
8. Water soluble hydrolyzed protein.

The product can be in chilled or frozen form. In chilled form product shall be stored and transported at or below 4 °C and in frozen form it shall be stored and transported at or below minus 18 °C.

Microbial Standards for Meat and Meat Products

Product Category	Aerobic Plate Count		Yeast and Mold Count		<i>Escherichia coli</i>		<i>Staphylococcus aureus</i> (Coagulase +ve)	
	Limits (cfu/g)		Limits (cfu/g)		Limits (cfu/g)		Limits (cfu/g)	
	m	M	m	M	m	M	m	M

Raw marinated/ minced/ comminuted meat	5x10 ⁵	5x10 ⁶	1x10 ⁴	5x10 ⁴	1x10 ²	1x10 ³	1x10 ²	1x10 ³
Cooked Meat Products	1x10 ³	1x10 ⁴	10	1x10 ²	10	1x10 ²	10	1x10 ²
Test Methods	IS: 5402/ISO 4833		IS: 5403/ISO 21527		IS: 5887 Part1 or ISO 16649-2		IS 5887: Part 2 or IS 5887 Part 8 (Sec 1)/ ISO: 6888-1 or IS 5887 Part 8 (Sec 2)/ISO 6888-2	

Product Category	Salmonella	Listeria monocytogenes	Sulphite Clostridia Reducing		Clostridium Botulinum		Campylobacter Spp*	
	Limits (cfu/g)	Limits (cfu/g)	Limits (cfu/g)		Limits (cfu/g)			Limits (cfu/g)
	m M	m M	m	M	m	M	m	M
Raw marinated /minced/ comminuted meat	Absent	NA NA	NA	NA	NA	NA	NA	NA
Cooked Meat Products	Absent	Absent	1x10 ²	1x10 ³	NA	NA		Absent
Test Methods	IS: 5887 Part 3/ ISO 6579	IS: 14988, Part 1 & 2/ISO 11290-1 & 2	ISO 15213		IS:5887, Part 4 or ISO 17919		ISO 10272-1&2	

Use of food additives in food products

Food products may contain additives as specified in these regulations and in the following Tables.

Meat and meat products including poultry					
Food Category System	Food Category Name	Food Additive	INS No	Recommended Maximum Level	Note
8.3	Processed comminuted	Brilliant blue FCF	133	100 mg/kg	XS96, XS89,

	meat and poultry products				XS98, XS97, 4, 16
		Butylatedhydroxyanisole (BHA)	320	200mg/kg	XS89, XS98, 130, 15
		Caramel III - ammonia caramel	150c	GMP	XS89, XS98, XS96, XS97, 3, 4, 16
		Caramel IV - sulfite ammonia caramel	150d	GMP	XS89, XS98, XS96, XS97, 3, 4, 16
		Erythrosine	127	30 mg/kg	4, 290
		Grape skin extract	163(ii)	5,000 mg/kg	XS89, XS98, 16
		NITRITES		80 mg/kg	286, 32
		Paprika oleoresin	160c(i)	GMP	
		PHOSPHATES		2,200 mg/kg	33, 302
		POLYSORBATES		5,000 mg/kg	XS89, XS98
		RIBOFLAVINS		1,000 mg/kg	XS96, XS97, 16
		Propyl gallate	310	200 mg/kg	XS89, XS98, 15, 130
		Propylene glycol alginate	405	3,000 mg/kg	XS89, XS98
		SORBATES		1,500 mg/kg	XS89, XS98, 42
		Sodium diacetate	262(ii)	1,000 mg/kg	XS89, XS98
		TOCOPHEROLS		500 mg/kg	XS 89, XS 98
		Tertiary butylhydroquinone (TBHQ)	319	100 mg/kg	XS 89, XS 98, 15, 130, 162]

4.2 FOOD SAFETY AND STANDARDS (CONTAMINANTS, TOXINS AND RESIDUES) REGULATIONS, 2011

CONTAMINANTS, TOXINS AND RESIDUES

2.1: METAL CONTAMINANTS

2.1.1

1. Chemicals described in monographs of the Indian Pharmacopoeia when used in foods, shall not contain metal contaminants beyond the limits specified in the appropriate monographs of the Indian Pharmacopoeia for the time being in force.

2. Notwithstanding anything contained in clause (1) above, no article of food specified in column (2) of the table below shall contain any metal specified in excess of the quantity specified in column (3) of the said table:

Name of metal contaminant	Article of food	Parts per Million (mg/kg or mg/L)
(1)	(2)	(3)
Lead	Corned beef, Luncheon meat, Cooked ham, chopped meat, Canned chicken, Canned mutton and Goat meat and other related meat products	2.5

2.2 Crop contaminants and naturally occurring toxic substances

2.2.1

15[1. No article of food specified in column (2) of the Table below shall contain any crop contaminant specified in the corresponding entry in column (1) thereof in excess of quantities specified in the corresponding entry in column (3) of the said Table:

Name of naturally occurring toxic substances (NOTS)	Article of food	Maximum limits (ppm)
(1)	(2)	(3)
Saffrole	Meat preparations and meat products, including poultry and game	10

2.3 : Residues

14 [2.3.1. Restriction on the use of insecticides:

(1) The expression “insecticide” shall have the meaning assigned to it in the Insecticide Act, 1968 (46 of 1968).

(2) Subject to the provisions of clause (3), no insecticides shall be used directly on articles of food: Provided that nothing in this regulation shall apply to the fumigants which are registered and recommended for use as such on articles of food by the Registration Committee, constituted under section 5 of the Insecticides Act, 1968 (46 of 1968).

Food	Name of the Insecticide	Maximum Residue Limit (MRL) in mg/kg
Meat and Meat products	Acephate (expressed as mixture of Methamidophos and acephate).	0.05
	Acetamiprid	0.05
	Chlorantraniliprole	0.2
	Chlorothalonil	0.02
	Bitertanol	0.05
	Chlothianidin (Chlothianidin and its metabolites Thiazolymethylguanidine (TMG), Thiazolymethylurea (TZMU), Methylnitroguanidine (MNG) TMG)	0.02
	Deltamethrin (Decamethrin)	0.05
	Difenoconazole	0.2
	Dimethoate	0.05
	Mancozeb	0.1
	Ethofenprox (Etofenprox)	0.5

	Fenpropathrin	0.02
	Fipronil	0.01
	Flusilazole	1
	Glyphosate	0.05
	Imidacloprid	0.1
	Indoxacarb	2
	Kresoxim Methyl	0.05
	Methomyl	0.02
	Oxydemeton-Methyl	0.05
	Penconazole	0.05
	Profenofos	0.05
	Propiconazole	0.01
	Spinosad	2
	Tebuconazole	0.05
	Thiacloprid	0.1
	Thiodicarb	0.02
	Thiamethoxam	0.02
	Triadimefon	0.02* * Maximum Residue Limit fixed at Limit of Quantification (LOQ)
Meat and Poultry	Sum of benomyl and carbendazim expressed as carbendazim	0.1 (carcass fat basis)
	Carbendazim	0.1(Carcass fat basis)

	Carbofuran (sum of carbofuran and 3-hydroxy carbofuran expressed as carbofuran)	0.10 (carcass fat basis)
	Chlorpyrifos	0.1
	Cypermethrin (sum of isomers) (Fat soluble residue)	2
	Edifenphos	0.02 (carcass fat basis)
	Fenvalerate (Fat soluble residue)	1.0 (carcass fat basis)
	Phenthoate	0.05 (carcass fat basis)
	Phorate (sum of Phorate, its oxygen analogue and their sulphoxides and sulphones, expressed as phorate)	0.02* (carcass fat basis)

2.3.2: ANTIBIOTIC AND OTHER PHARMA-COLOGICALLY ACTIVE SUBSTANCES

Following antibiotics and veterinary drugs are not permitted to be used at any stage of processing of meat and meat products, poultry and eggs, sea foods including shrimps, prawns or any variety of fish and fishery products. The Extraneous Maximum Residue Limit of 0.001 mg/kg will be applicable except for Chloramphenicol for which it shall be 0.0003 mg/kg (0.3 ug/kg).

1. Nitrofurans including-

- (i) Furaltadone
- (ii) Furazolidone
- (iii) Nitrofurantoin
- (iv) Nitrofurazone

2. Chloramphenicol

3. Sulphamethoxazole

4. *Aristolochia* spp and preparations thereof

5. Chloroform

6. Chlorpromazine

7. Colchicine

8. Dapsone.

9. Dimetridazole

10. Metronidazole
11. Ronidazole
12. Ipronidazole and other nitromidazoles
13. Clenbuterol
14. Diethylstilbestrol
15. Glycopeptides
16. Stilbenes and other steroids
17. Crystal Violet
18. Malachite Green
19. Carbadox

4.3 FOOD SAFETY AND STANDARDS (PACKAGING AND LABELLING) REGULATIONS, 2011

FSSAI 2.1: Packaging 2.1.1: General Requirements

1. A utensil or container made of the following materials or metals, when used in the preparation, packaging and storing of food shall be deemed to render it unfit for human consumption:— (a) containers which are rusty; (b) enamelled containers which have become chipped and rusty; (c) copper or brass containers which are not properly tinned (d) containers made of aluminium not conforming in chemical composition to IS:20 specification for Cast Aluminium & Aluminium Alloy for utensils or IS:21 specification for Wrought Aluminium and Aluminium Alloy for utensils.

2. Containers made of plastic materials should conform to the following Indian Standards Specification, used as appliances or receptacles for packing or storing whether partly or wholly, food articles namely: —

- (i) IS: 10146 (Specification for Polyethylene in contact with foodstuffs);
- (ii) IS: 10142 (Specification for Styrene Polymers in contact with foodstuffs);
- (iii) IS: 10151 (Specification for Polyvinyl Chloride (PVC), in contact with foodstuffs);
- (iv) IS: 10910 (Specification for Polypropylene in contact with foodstuffs);
- (v) IS: 11434 (Specification for Ionomer Resins in contact with foodstuffs);
- (vi) IS: 11704 Specification for Ethylene Acrylic Acid (EAA) copolymer.
- (vii) IS: 12252 - Specification for Poly alkylene terephthalates (PET).
- (viii) IS: 12247 - Specification for Nylon 6 Polymer;
- (ix) IS: 13601 - Ethylene Vinyl Acetate (EVA);
- (x) IS: 13576 - Ethylene Metha Acrylic Acid (EMAA);
- (xi) Tin and plastic containers once used, shall not be re-used for packaging of edible oils and fats; Provided that utensils or containers made of copper though not properly tinned, may be used for the preparation of sugar confectionery or essential oils and mere use of

such utensils or containers shall not be deemed to render sugar confectionery or essential oils unfit for human consumption.

Labelling Requirements

All food products sold in India that are pre-packaged are required to comply with the Food Safety and Standards (Packaging and labelling) Regulations, 2011. The Food Safety and Standards Regulation, 2011 is a notification issued by the Food Safety and Standards Authority of India under the Ministry of Health and Family Welfare.

Applicability of Food Labelling Regulations

The food labelling regulations require all “Pre-packaged” or “Pre-packed food” to comply with the labelling regulations in India. As per the rules, pre-packaged food means food, which is placed in a package of any nature, in such a manner that the contents cannot be changed without tampering it and which is ready for sale to the consumer.

General Labelling Requirements

The following labelling requirements must be complied with by all pre-packaged food sold in India:

- The label must be in English or Hindi or Devnagri language. In addition to the above, the label can contain information in any other language, as required.
- The label must not contain information about the food that could be deemed to be false, misleading, deceptive or otherwise create an erroneous impression regarding the product.
- The label must be affixed to the container in such a manner that it would not easily be separated from the container.
- The contents or information presented in the label should be clear, prominent, indelible and readily legible by the consumer.
- If the container is covered by a wrapper, then the wrapper must contain necessary information or make the label of the product inside readily legible by not obscuring.
- The name of the food must be mentioned along with the trade name and description of the food contained. In case the food contains more than one ingredient, then a list of ingredients must be presented in descending order of their composition by weight or volume, as the case may be, at the time of its manufacture;

Nutritional Information

- Nutritional Information or nutritional facts per 100 gm or 100ml or per serving of the product must be given on the label along with the following information:
- energy value in kcal;
- the amounts of protein, carbohydrate (specify the quantity of sugar) and fat in gram (g) or ml;
- the amount of any other nutrient for which a nutrition or health claim is made:

It is important to note that any “health claim” or “nutrition claim” or “risk reduction” claim made in the label will be thoroughly scrutinized by the FSSAI authorities. Hence, any such claim must be validated by test data. As per the rules, the following is the definition for “health claim”, “nutrition claim” and “risk reduction” claim:

- **“Health claims”** means any representation that states, suggests or implies that a relationship exists between a food or a constituent of that food and health and include nutrition claims which describe the physiological role of the nutrient in growth, development and normal functions of the body, other functional claims concerning specific beneficial effect of the consumption of food or its constituents, in the context of the total diet, on normal functions or biological activities of the body and such claims relate to a positive contribution to health or to the improvement of function or to modifying or preserving health, or disease, risk reduction claim relating to the consumption of a food or food constituents, in the context of the total diet, to the reduced risk of developing a disease or health-related condition;
- **“Nutrition claim”** means any representation which states, suggests or implies that a food has particular nutritional properties which are not limited to the energy value but include protein, fat carbohydrates, vitamins and minerals;
- **“Risk reduction”** in the context of health claims means significantly altering a major risk factor for a disease or health-related condition

Veg or Non-Veg Symbol

All packaged food that is “Non-Vegetarian” must have a symbol that is a brown colour filled circle inside a square with a brown outline. If a food contains only egg as a non-vegetarian ingredient, then the manufacturer may provide a declaration that the product contains only egg and add the non-vegetarian symbol



Non-Veg Symbol

Information Relating to Food Additives, Colours and Flavours

Food additives contained in the food product must be mentioned along with class titles along with the specific names or recognized international numerical identifications. Addition of colouring matter should be mentioned on the label along with certain statements like “CONTAINS PERMITTED NATURAL COLOUR(S)”, just beneath the list of the ingredients on the label. In case of addition of extraneous flavouring agent, then it should be mentioned in a statement like “CONTAINS ADDED FLAVOUR” just beneath the list of ingredients on the label.

Name and Complete Address of the Manufacturer

The name and complete address of the manufacturer must be mentioned on every package of food. In the case of imported food, the package must contain the name and complete address of the importer in India.

Net Quantity

All packaged food must carry the net quantity by weight or volume or number, as the case may be. The net quantity of the commodity contained in the package must exclude the weight of the wrappers and packaging materials.

Lot Number or Batch Identification

A lot number or batch number or code number must be mentioned on all packaged food so that it can be traced while manufacturing and distribution. Only bread and milk including sterilised milk are not required to comply with this regulation.

Date of Manufacture or Packing

The date, month and year in which the commodity is manufactured, packed or pre-packed must be mentioned on the label. In the case of food products having a shelf life of more than three months, then the month and the year of manufacture can be given with the “Best Before Date”. In case of products having a shelf life of fewer than three months, the date, month and year in which the commodity is manufactured or prepared or pre-packed must be mentioned on the label with best before date.

Country of Origin for Imported Food

For imported food, the country of origin of the food should be declared on the label of the food. In case a food product undergoes processing in a second country which changes its nature, the country in which the processing is performed should be considered to be the country of origin for the purposes of labelling.

Instructions for Use

Instructions for use, including reconstitution, should be included on the label, if necessary, to ensure correct utilization of the food.

4.4 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.



Contact Us

National Institute of Food Technology, Entrepreneurship and Management (NIFTEM) - Thanjavur

(an Institute of National Importance under Ministry of Food Processing Industries, Government of India)

Pudukkottai Road, Thanjavur – 613005, Tamil Nadu, India

Ph: 04362-228155, Fax: 04362-227971

Email: director@iifpt.edu.in Web: <https://niftem-t.ac.in/>

