MINISTRY OF FOOD PROCESSING INDUSTRIES
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NIFTEM
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PM Formalisation of
Micro Food Processing Enterprises Scheme

Processing of Millet Pasta

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INTRODUCTION

1.1 Introduction

“Pasta” is derived from the word "paste" and so pasta is a food derived from a paste made almost exclusively from wheat flour. Pasta, at its most basic, is nothing more than flour and water, rolled out and cut into shapes or extruded. Pasta is a collective term that refers to grain products such as spaghetti, noodles, macaroni and vermicelli. Traditionally, the .raw materials for these products are: durum-wheat semolina, water and eggs.The basic ingredients, the shapes and names of pasta products are almost limitless, with more being added yearly. It is a universal product consumed worldwide. It is most often comes in a wide variety of shapes and colors. Pasta is of course very popular because it is convenient, nutritional, economical and can be used in a great number of ways, as the base for a main course or as a garnishing.

1.2 What are millets? Types of millets, their health benefits?

Millets are one of the oldest food grains known to mankind and possibly the first cereal grain used for domestic purposes. For centuries, millets have been a prized crop in India and are staple diet for nearly 1/3rd of the world's population. They can adapt themselves to marginal soils and varied environmental conditions. Millets are cereal crops and small seed grasses, which are widely used in African and Asian countries. Majorly cultivated in the semiarid tropical regions of Africa and Asia, around 97 percent of world’s overall millet production happens in these regions. Millets are a major food source in arid and semi-arid parts of the world. Millets are good sources of energy. They provide protein, fatty acids, minerals, vitamins, dietary fibre and polyphenols. Typical millet protein contains high quantity of essential amino acids especially the sulphur containing amino acids (methionine and cysteine). Processing millet by milling removes the bran and germ layers that are rich in fibre and phytochemicals, causing significant loss. The millets are source of antioxidants, such as phenolic acids and glycated flavonoids. Millet foods are characterized to be potential prebiotic and can enhance the viability or functionality of probiotics with significant health benefits.

Types of Millets

Jowar (Sorghum)

Sorghum is commonly known as Jowar in India. Traditionally, jowar was used as a grain to make flat breads/ rotis. Enriched with the goodness of iron, protein and fibre, jowar can help in reducing cholesterol level as it has a component called policosanols (a part of sorghum wax). It is good for people who have wheat intolerance.

Ragi (Finger Millet)

Ragi is used as a healthy substitute for rice and wheat. Ragi is undoubtedly a powerhouse of nutrition. Loaded with protein and amino acids, this gluten free millet is good for brain development in growing kids.

Foxtail millet

Foxtail millet has healthy blood sugar balancing carbohydrates, and it is popularly available in the form of semolina and rice flour. The presence of iron and calcium in this millet helps in strengthening immunity.

Bajra (Pearl millet)

This millet is known for its umpteen health benefits. Packed with the goodness of iron,protein, fibre, and minerals such as calcium and magnesium; the daily consumption or inclusion of this millet can work wonders.

Barnyard millet

This nutrient dense millet has high fiber content, which can effectively help in losing weight. It is a rich source of calicum and phosphorius, which helps in bone building and its daily consumption, helps in fighting bone diseases.

Proso millet

This millet can effectively help in balancing blood sugar level. Its low glycemic index has made it a fad among weight watchers. In India is has been a commonly bird feed.

Little millet

Packed with the goodness of B-vitamins, minerals like calcium, iron, zinc and potassium, little millets can provide essential nutrients, which further help in weight loss. It is a part of many traditional dishes in south India. What's more, more than anything its high fiber content makes it healthy replacement rice.

1.3 Nutrient Composition of Millets

The millet grain contains about 65% carbohydrate, a high proportion of which is in the form of non-starchy polysaccharides and dietary fibre which help in prevention of constipation, lowering of blood cholesterol and slow release of glucose to the blood stream during digestion. Lower incidence of cardiovascular diseases, duodenal ulcer and hyperglycemia (diabetes) are reported among regular millet consumers. Millet grains are also rich in important vitamins *viz*., Thiamine, riboflavin, folic acid and niacin. Millets are comparable to rice and wheat or rich in some of the minerals as well as fatty acids. Millets vary largely in composition of carbohydrates as proportion of amylose and amylopectin content vary from 16-28% and 72-84%, respectively.

The nutrient composition of Millet grain indicates that it is a good source of energy, protein, vitamins and minerals including trace elements. The edible component of millet kernel is the rich source of phytochemicals, such as dietary fiber and polyphenols (0.2-0.3%) (Hadimani and Malleshi 1993; Ramachandra *et al.,* 1977). Millets contribute to antioxidant activity with phytates, polyphenols and tannins present in it having important role in aging and metabolic diseases (Bravo, 1998). The highest calcium content is present is finger millet with 344 mg/100g among the cereals; Also rich in phytates 0.48g/100g, polyphenols, tannins 0.61% (Thompson, 1993).

Sorghum has 11.9 per cent of moisture and about 10.4 per cent of protein and a lower fat content of 1.9 per cent. The fibre and mineral content of grain sorghum is essentially similar, and

is 1.6 per cent. It is a good source of energy and provides about 349 K cal and gives 72.6 per cent of carbohydrates (Gopalan *et al.*, 1996). Starch is the major carbohydrate of the grain. The other carbohydrates present are simple sugars, cellulose and hemicellulose. The amylose content of starch varies from 21.28 per cent. Sorghum is also rich in dietary fibre (14.3%). Calcium, phosphorous and iron content of sorghum is 25 mg, 222 mg and 4.1 mg (per 100 g of edible portion), respectively (Hosmani and Chittapur, 1997).

In addition, black finger millet contains 8.71 mg/g dry weight fatty acid and 8.47 g/dry weight protein (Glew *et al,* 2008). Kodo millet and little millet were also reported to have 37% to 38% of dietary fiber, which was once considered as 'anti-nutrient' and is now termed as a nutraceutical and highest among cereals (Hadimani and Malleshi, 1993; Hegde and Chandra, 2005). Thus, it makes millets a complete food ingredient suitable for large scale utilization as processed products, snacks, baby foods etc., and also plays a major role in propagating food

Table 2. Proximate composition of millet grain varieties.

Component (g/100g, dry basis)	Foxtail millet flour	Fonio whole grain	Proso millet dehulled grain	Pearl millet whole grain	Finger millet native grain
Protein	11.50	9–11	11.58	14.8	8.2
Ash	0.47	1–1.1	NA	1.64	2.7
Fat	2.38	3.3–3.8	4.9	4.86	1.8
Total CHO*	75.2	84–86	80.1	59.8	83.3
Crude fiber	NA	NA	0.7	12.19	3.5
References	Kamara et al. (2009)	Vodouhe et al. (2003)	Bagdi et al. (2011)	Taylor et al. (2010)	Devi et al. (2011)

*Carbohydrate (CHO). NA: not available.

security among under developed and developing countries.

1.4 Health Benefits of Millets

Millets have potential health benefits and epidemiological studies have showed that consumption of millets reduces risk of heart disease, protects from diabetes, improves digestive system, lowers the risk of cancer, detoxifies the body, increases immunity in respiratory health, increases energy levels and improves muscular and neural systems and are protective against

several degenerative diseases such as metabolic syndrome and Parkinson's disease (Manach *et al.,* 2005; Scalbert *et al.*, 2005; Chandrasekara and Shahidi, 2012). The important nutrients present in millets include resistant starch, oligosaccharides, lipids, antioxidants such as phenolic acids, avenanthramides, flavonoids, lignans and phytosterols which are believed to be responsible for many health benefits (Miller, 2001; Edge *et al.*, 2005).

CHAPTER 2

PREPARATION OF MILLET PASTA

2.1 Pasta making

Wheat flour has several components that give the paste or dough that suits the ideal properties for pasta making. Although flour is made up of many different components, the most important are starch, glutenin and gliadin. Starch is a complex carbohydrate made-from chains of sugar molecules. ln wheat flour starch exists in the form of "tiny little balls". Glutenin and gliadin are proteins. ln flour they are separate molecules, but with the addition of liquid they link together to form a larger molecule known as gluten. Gluten forms strands and these strands interlock to form a large tangled net.This gluten net traps the starch grains (like a tangle of wire springs trapping a collection of basketballs) and gives the pasta dough elastic so that it can be stretched and deformed without breaking.

Depending on the type of wheat, these components can vary in proportion. Thus in the pasta making, amount of gluten finds an important role. The less gluten the harder it for the gluten net to hold together the starch basketballs. Flour made from durum wheat (known as hard wheat flour or semolina flour) contains more glutenin and gliadin than softwheat flour and therefore produces dough containing more gluten. Durum-tvpe flour mixed with water can produce dough that is easily formed into threads and sheets of pasta. It is also possible to extrude this type of pasta dough to give us most of the familiar dried pasta shapes such as Linguine, Bucatini, Fusilli, Penne,Spaghetti.

lt is possible to make pasta dough from soft wheat flour and water alone, this dough commonly have eggs added. The egg proteins take on the same function as the gluten strands. Soft wheat flour is white in colour and therefore produces white pasta, unless copious amounts of

egg yolks are added to the pasta dough. While soft wheat flour plus egg forms dough that is good for making fresh pasta, the dried pasta that results is very brittle. Mostly dried egg pasta is made of semolina flour or a blend of flours that remain more stable when dry. The lower the amount of glutenin and gliadin protein in the flour, the more kneading will be required to form gluten. Both the gluten strands and starch grains absorb water. So once the dough has been kneaded it must be allowed to rest for a time to allow the starch grains to fully absorb water and break up. All these procedures produce- pasta with good mechanical properties and texture. Pasta can also be made from the cereal family of cultivated plants, which includes millets, rice, rye and corn.

2.2 Pasta manufacturing methods

2.2.1 A. Extrusion

It is a complexity process, involves mixing, melting at high heat, high pressure, short reaction times. It is a method of forming substances by forcing them through a perforate plate or die to produce tubes, rods, or other desired shapes(like squeezing toothpaste out of a tube).

Extrusion process variables

- Feed rate
- In-barrel moisture
- Screw speed
- Barrel temperature
- Die characteristics and screw design

Types of extruders

Forming

- Pasta (traditional)

Cooking

- Low-shear cooking (precooked pasta)
- Collet (puffed cereals)

Texturizing

- High-shear cooking (high protein products)

Extrusion methods

After the dough is mixed, it is transferred to the extruder. The extrusion auger not only forces the dough through the die, but it also knead the dough into a homogeneous mass, controls the rate of production and influences the overall quality of the finished product. Although construction and dimension of extrusion augers vary by equipment manufacturers, most modern presses have sharp edged augers that have a uniform pitch over their entire length. The auger fits into a grooved extrusion barrel, which helps the dough to move forward and reduces friction between the auger and the inside of the barrel. Extrusion barrels are equipped with a water-cooling jacket to dissipate the heat generated during the extrusion process. The cooling jacket also helps to maintain a constant extrusion temperature, which should be approximately 5OºC. lf the dough is too hot (above74ºC), the pasta will be damaged. Uniform flow rate of the dough through the extruder is also important. Variances in the flow rate by the dough through the die cause the pasta tobe extruded at different rates. The inside surface of the die also influences the product appearance.

The die function is to give the product the chosen shape. Until recently, most dies were made of bronze, which was relatively soft and required repair or periodic replacement. Recently, dies have been improved by fitting the extruding surface of the die with teflon inserts to extend-the life of the dies and improve the quality of the pasta. The great variety of .pasta kinds and sizesis due to the possibility of making specificdies. The long cut pasta, for instance, is produced in many different shapes.that can be summarized as follows:

(1) long round pasta without hole (eg.spaghetti)

(2) long round pasta with hole (eg.Bucati,ziti, zitoni,

(3) long ovit pasta (e.g. Iinguine)

(4) flat straightpasta withrectamgularsection (e.g. fettuccine).

(5) flat straightpasta with simple (on one side) ordouble (on both sides)festoons e.g. malfade, curly lasagna), and

(6) the dimensionsof these shapes (section, diameter, length, width, thickness)can vary from a producer to another, even if many shapeshave standard commercial values.

Teflon made (left)

Bronze made (Right

Advantages of extrusion processing

- Feed rate
- In-barrel moisture
- Screw speed
- Barrel temperature
- Die characteristics and screw design

2.2.2 B. Sheeting or Rolling methods

Basically flour is mixed together with ingredients. Water is added to the mix and kneading the dough to make it uniform, folding it over and pressing it with fists. This process is repeated several times to get a uniform mass of dough. Then roll out the dough with a rolling pin, first getting a thick sheet that is gradually made thinner as you roll it out, i.e. it gets pressed down-as the rolling pin passes over it. Cut into pieces, the dough is then passed between. Two overlapping rollers (cylinder, starting to gradually make it thinner with repeated-rolling to obtain a sheet of the desired thickness'.

With the automatic sheeters, the mass of the dough is made uniform by rolling it extremely thin, to break up the granules,letting the sheet produced overlap and form a mass. The next rolling is done with the rollers spaced apart and after turning the mass round, so as to cross the fibres in the dough. Afterwards it is rolled several more times to refine the mass and obtain a sheet of the desired thickness.

Drying Phases: Plastic State and Elastic State

On leaving the die, pasta normally has moisture content of approximately 31-32%. Pasta is in "plastic state" depending on the type of dough and the shapes made. It is considered dry when its internal moisture content is equal to or less thanl2.5% and balanced with the surrounding environment. This means that, to keep well, besides being dry, pasta needs to be “stable”: in other words, within certain environmental climatic limits (air temperature and humidity) it must keep its remaining internal moisture content uniform.

This condition has specific physical properties: a body in a plastic state can deform under the action of external forces without any particular tension forming inside it and moreover, it can permanently keep the shape acquired as a result of these forces. Pasta in its plastic state can then undergo even powerful drying without this causing any internal tension and the risk of damage also the deformation (contraction) suffered due to extraction-of the water will be maintained. In the "plastic-state" the contraction of the pasta is generally in proportion to the amount of water subtracted from it.

When proceeding with drying, the product's moisture content falls further (22-18%), the state of the pasta changes from plastic to elastic. ln this new state the product's behaviour is totally different: an elastic body subjected to stress deforms but tends to recover its original shape as soon as the stress stops. Besides causing deformation, stresses can then bring about tension inside the product. If the tension comes within the product's specific limit of elasticity, it can be absorbed precisely by its own elasticity; whereas, if it exceeds this limit it will inevitably be damaged.

This is exactly what happens when drying pasta: when the moisture inside the product falls to approximately20% its physical state passes from being "plastic" to "elastic". Clearly, the moisture level making the change in state is not fixed; it can change according to the temperature of the product. In addition, this change is never sudden, it happens progressively: close to the above-mentioned moisture level ,both states, plastic and elastic, initially coexist in proportions continually varying until the change of state is complete.

Since drying pasta brings about a reduction in its moisture content from 30% to 12%, it is done technologically in two distinct phases that correspond to the plastic and elastic states of the product. During pre-drying (first phase) the moisture content of the product falls from 30-32% lo 18-17%.The time this phase takes depends on a few variables, the main one of which is temperature. Rapidly heating the product causes drastic evaporation of the water on the surface of the pasta and therefore an equally drastic migration of water particles from the inside towards the surface.

The first transfer of water takes place at the cost of the starch, which during preparation of the dough has absorbed approximately 20% as much of it as the gluten. Afterwards, by osmosis, the water moves from the gluten to the starch. Since gluten is elastic it tends to follow the water particles, moving from the innermost parts of the product, where it is more highly concentrated because there is more moisture there, towards the outside. This redistribution of gluten can take place at up to approximately 26% moisture of the pasta.

In brief, this pre-drying technology makes it possible to accomplish: partial blockage of some enzyme activity and virtually total blockage of any product fermentation, helping to sanitize it, since there are relatively few micro-organisms that at 75ºC are capable of surviving, and also any insect eggs are easily destroyed. Uniform gluten distribution making full use of the capacity of gluten to hold back the starch particles (so better cooking capacity and less stickiness of the product). A decrease in oxidation of the yellow pigments contained in the semolina and therefore a brighter colour of the dried product. The following phase of drying must envisage alternating phases of water evaporation from the surface and redistribution inside.

The speed of this phase is inevitably less than that of pre-drying because the structure of the product (passed on to the elastic state) has become more rigid, capillary action has decreased and so the migration of the remaining particles of water from the inside to the outside of the product is slower. Thus. drying phase is a delicate one because on the one hand it is necessary to prevent drying that is too fast from completely blocking the capillary action of the pasta (with disastrous consequences for the product), on the other hand it is always a good rule for drying to be completed relatively quickly, compatibly with the technology used.

2.3 Pasta process and sanitation technologies

Fresh pasta is a foodstuff with a high water content ((30%max) for fresh packaged pasta) and therefore easily perishable. Its spoilage is due both to the metabolic activity of micro-organisms (bacteria, yeast, moulds), which can easily grow in the product, and to various enzymatic activities.The presence of micro-organisms is unavoidable: all techniques applied throughout the production process can only restrict their number and effects without eliminating them.So the preserving capacity of fresh-pasta (shelf life) is essentially due to the level of the microbial count found in product at the end of the process and to the efficacy of methods used to avoid proliferation of micro-organisms leftover, as well as repollution of product after being pasteurized. The techniques used to this end are:

(1) The sanitation of the product by means of heat treatment (pasteurization),
(2) The use of barriers to prevent a new contamination of the sanitized product (environment conditioning; devices for antimicrobial and bacteriostatic control in the production rooms; product packaging),
(3) The adoption of barriers to restrict the growth of micro-organisms surviving to sanitation (modified atmosphere packaging, cooling).

2.4 Quality evaluation of pasta products

Appearance

Appearance of pasta is influenced by its size and shape, colour, uniformity, clarity and surface texture: Desirable attributes of pasta are translucent, bright yellow, free from excessive specks, cracks or checks and smooth surface.

Mechanical Strength

Mechanical strength of dry pasta is important as the product has to with stand the rigours of cutting, packing, handling and transport. The pasta mechanical strength is measured subjectively by squeezing or bending by hand or objectively using Instron Universal Testing Instrument.

Cooking Quality

The pasta should have pleasing flavour and mouthfeel, should retain yellow colour, should not release excess solids into the cooking water, should not be sticky when eaten and should exhibit some firmness to bite.

Common types of pasta

Macaroni

There are two types of macaroni known as long and cut goods. The long goods are smooth or corrugated tubular rods. Having outer diameter ranging between 3 an4.5mm and wall thickness of about lmm, The length is in the range between 250 and275mm. The cut goods are in the form of elbows, tubes, shells, alphabets, numerals, stars, wheels, rings, rice, melons seeds etc.

Sphagetti

It is in the form of solid rods having diameter of 1mm and length ranging from 250 and 275 mm.

Vermicelli

It is in the form of solid rods having diameter between 0.5 and 1.2 mm and length ranging from 25 to 250 mm.

2.5 Value addition in pasta

Increased demand by growing number of health conscious consumers for healthy foods has shifted the interest of researchers and food manufacturers to develop pasta products rich in minerals, vitamins, fiber, and with low glycemic index. In the recent past, the food industry has made a continuous effort to introduce newer functional pasta products enriched with nutrients and bioactive compounds.Incorporation of other grains has resulted in higher dietary benefits, such as increased essential amino acids, minerals, vitamins and phenolic compounds.

Incorporation of millet flour to pasta development will improve the antioxidant and nutraceuticals properties of pasta by increasing its content of minerals. Therefore, millets hold a good potential as a source of nutraceuticals in pasta formulations

2.6 Process flow for making millet pasta

Millet flour + whole wheat flour (0.5:1)

Sieving

Flour mixing tank (homogenous mixture)

Addition of water (525ml)

Conditioning (To obtain coarse texture)

Transfer and knead in pasta machine (One minute)

Extrude (Single screw)

Dicing to desirable size with desirable die

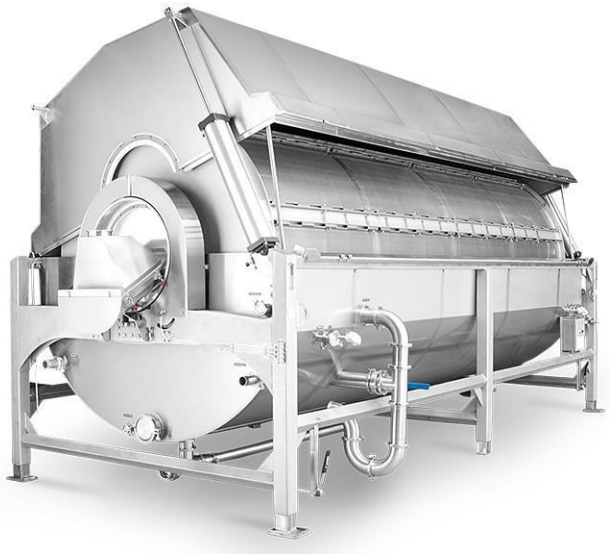
Steaming for 20min (Partial cooking)

Drying using tray dryer @ 55ºC for 6hrs

Cool to room temperature

Packaging & storage

Pasta Making Machine



Steam Blancher

Tray drier

CHAPTER 3

PACKAGING OF MILLET PASTA

3.1 Pasta Packaging

To ensure the quality of pasta products, it is essential to provide proper packaging. The commercial evolution of food pasta has led to a parallel evolution in packaging and production techniques. Packaging keeps the product free from contamination, protects pasta from damage during shipment and storage, and displays the product favourably. The principal packaging material for pasta is the cellophane bag, which provides moisture-proof protection for the product and is used easily on automatic packaging machines, but is difficult to stack on grocery shelves. Many manufacturers utilize boxes instead of bags to package pasta because boxes are easy to stack, provide good protection for fragile pasta products, and offer the opportunity to print advertising that is easier to read than on bags.

A proper packaging system provides not only the required physical protection that maintains the integrity of a food product but also the needed microenvironment that minimizes quality degradation.

3.2 Functions of pasta packaging

It is important to understand the functions of pasta packaging to effectively select, design, and utilize noodle packaging systems. The functions of noodle packaging can generally be described as

(1) to provide containment,

(2) to protect quality of pastas (Physical integrity, sensory quality & Food safety),

(3) to provide convenience,

(4) to enhance marketability, and

(5) to provide traceability.

3.2.1 Components of pasta packaging

Like most food packages, pasta packaging is usually composed of three components:

(1) Primary package,

(2) Secondary package, and

(3) Tertiary package.

Depending on the specific pasta product and the way it is served, there could be at least one or two or all three components used in a noodle packaging system.

A primary package is defined as a package that is directly in contact with the pasta product. It is mainly used to form a sealed microenvironment to protect and isolate the pasta content from an unwanted environment (e.g., high humidity, oxygen, microbial) and other contamination from dust and undesired human contact.

Secondary package is the package that contains one or more primary packages. A secondary package can also be used to provide convenience in handling. Another function of the secondary package is to provide pasta product information such as lot number, production and expiration dates, and nutritional labels. It is also often used as a product display box.

A tertiary package incorporates the secondary package in the final shipping and distribution. The purpose is to consolidate secondary packages and to assist in storage and handling and to provide an additional layer of protection for the packaged pasta against physical

damage and weather conditions. Examples are corrugated boxes, pallets, and stretch plastic films.

3.2.2 Key factors in pasta packaging

- Water activity,
- pH, and
- fat content

3.2.3 Packaging barrier requirements for pasta packaging

Material	Water Vapor Transmission Rate [g/(m^2 · day) at 38 °C and 90% RH]	Gas Permeability [cm^3/(m^2 · day) at 1 atm] for 25-μm Film at 25 °C		
		Oxygen	Carbon Dioxide	Nitrogen
Polyethylene				
LD	18	7800	42,000	2800
HD	7–10	2600	7600	650
Oriented polypropylene (OPP)	6–7	2000	8000	400
Polyester (PET)	400–600	800–1500	7000–25,000	600–1200
Oriented polyester	25–30	50–130	180–390	15–18
Oriented polystyrene (OPS)	100–125	5000	18,000	800
Polyvinyl chloride (PVC)	15–40	500–30,000	1500–46,000	300–10,000

3.3.1 Dried pasta packaging using cellophane bags

Dried pasta have been dehydrated to a low moisture content of less than 12% to achieve extended shelf life. They are often packaged in watertight and airtight bags and containers. The shelf life of the dried noodles varies anywhere from several months to 2 years, depending on the ingredients used and how they are processed, packaged, and stored.

Cellophane bags which are moisture-proof, easy to use in automatic machines, but difficult to stack, and boxes which are easy to stack and print advertising, and protect the fragile pastas. In packaging line the product is first scaled, then sealed in the package, detected for open flap and metals, double-checked the weight and last packed in large cases.

3.3.2 Long pasta packaging: First the product is weighed by about five scales on a packaging line, then transferred to mechanical buckets which are fitted to the opening of the cartons. The

system which is used for long pasta packaging is called horizontal cartoner in which buckets and cartons are both move forward on the packaging line and pasta is poured to the cartons by a mechanical pushing device from the bucket. The cartons then are closed and sealed.

3.3.3 Short pasta packaging: The process of packaging for short pasta are similar to those used for long pasta except that vertical cartoner is used in which the scaling unit is located over the cartoner and weighed pasta is dropped to the passing cartons using only gravity.

3.3.4 Flexible poach packaging: Both long and short pasta can be packed in flexible plastic packaging materials. The system is called standard form/fill/seal system which is similar to carton packaging.

3.3.5 Plastic overwrapping packaging: The weighed product is manually placed onto a shallow rigid plastic tray and a plastic film is wrapped around the tray and overwrap the package. It then passes a heat tunnel which causes the film to shrink around the pasta.

3.3.5 Modified Atmosphere Packaging (MAP)

"Modified atmosphere" refers to the addition or removal of gases and/or water vapor from a food package or container to change the levels of gases and/or water vapor and to obtain gas and water vapor compositions inside the package that are different from that of normal or ambient air. The atmosphere inside a noodle package can be modified passively and actively. In passive MAP, such modification is mainly realized through the permeation from the packaging materials and the container, that is, the permeability or barrier properties of the packaging container are the determining factors. For example, plastic bags with high water-vapor barrier are used to protect dried pasta from absorption of moisture in high-humidity storage conditions.

3.3.7 Vaccum packaging

Vacuuming eliminates most of the oxygen from the package and slows down the growth of microorganisms, thus extending the shelf life of the fresh noodles. For frozen noodles, vacuuming can remove air from the package and minimize surface frosting and freezer burn caused by variation of the storage temperature, resulting in extended shelf life.

3.3.8 Active Packaging

Active packaging is a packaging technology that incorporates certain additives into packaging films/materials or within packaging containers to modify the packaged microenvironment for the benefit of extending shelf life of the packaged food.

(1) Antimicrobial packaging,

(2) Antioxidative packaging, and

(3) Oxygen-scavenging packaging.

3.3.9 Antimicrobial packaging

Antimicrobial packaging is a packaging system that can inhabit the growth of microorganisms in the packaged food to extend its shelf life and to enhance its safety for human consumption. The antimicrobial function can be realized by three means: (1) coating or constructing antimicrobial agents into the packaging materials, (2) including antimicrobial agents inside the package space, and (3) adding antimicrobial agents into the formulation of the packaged food. Only several types of antimicrobial agents are used for noodles and pasta products: organic acids and their salts, ethanol, and volatile essential oils.

3.3.10 Antioxidative Packaging

Antioxidative packaging is a packaging system that has antioxidants incorporated into its packaging materials to control the oxidation of fatty components and pigments of the packaged food. Synthetic antioxidants used for antioxidative packaging include butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA).

3.3.11 Oxygen-Scavenging Packaging

Oxygen-scavenging packaging refers to the packaging system that eliminates oxygen inside a food package by oxygen-absorbing sachets and/or by packaging materials imbedded with oxygen scavengers.

3.3.12 Intelligent Packaging

Intelligent packaging refers to a package that can sense environmental changes and, in turn, inform the user of these changes. . A packaging system such as this is able to sense and provide information about the functions and properties of the packaged foods, and/or contains an

external or internal indicator for the active product history and quality determination. Recently, radio frequency identification (RFID) technology has been developed as a more effective product information indicator.

CHAPTER 4

FOOD SAFETY REGULATIONS AND STANDARDS OF MILLET PASTA

4.1 Food Standards

6.4 Pastas and noodles and like products

Includes all pasta, noodles and similar products e.g. rice paper, rice vermicelli, soybean pastas and noodles.

6.4.2 Dried pastas and noodles and like products

Products that are untreated (i.e. not heated, boiled, steamed, cooked, pre-gelatinized or frozen) and are dehydrated. Examples include dried forms of: spaghetti, bean vermicelli, rice vermicelli, macaroni, and rice noodles.

2.4.10 MACARONI PRODUCTS

PASTA PRODUCTS: means the product obtained from one or a combination of ingredients including suji , maida , rice flour, groundnut flour, tapioca flour, edible soy flour or flour of any other cereal referred to in sub-regulation 2.4 by kneading the dough and extending it or by any other process. It may contain one or more of the following ingredients either singly or in combination: milk powder, fruit and vegetables and products thereof or their extracts; edible common salt, nutritive sweeteners, meat and products thereof; fish and products thereof; eggs and products thereof; spices, condiments and herbs including their extracts; vitamins and minerals; edible fats and oils; yeast extract, yeast and product thereof; hydrolysed plant protein and soy sauce powder. It may contain food additives specified in Appendix A appended to these regulations. It shall be free from dirt, insect's larvae and impurities or any other extraneous matter.

It shall conform to the following standards:-

Moisture: Not more than 12.5 per cent.

Ash insoluble in dilute HCl: Not more than 0.1 per cent (On dry basis)

Food Category System	Food Category Name	Food Additive	INS No	Recommended maximum level	Note
6.4	**Pastas and noodles and like products**				
6.4.2	**Dried pastas and noodles and like products**	Canthaxanthin	161g	15 mg/kg	211
		Caramel IV - Sulfite Ammonia Caramel	150d	50,000 mg/kg	211
		Diacetyl tartaric acid and fatty acid esters of glycerol	472e	5,000 mg/kg	
		PHOSPHATES		900 mg/kg	211,33
		Agar	406	GMP	256
		Alginic acid	400	GMP	256
		Ammonium Alginate	403	GMP	256
		Ascorbic acid, L-	300	GMP	256
		Calcium 5'-Ribonucleotide	634	GMP	256
		Calcium alginate	404	GMP	256
		Calcium Ascorbate	302	200 mg/kg	256
		Calcium Carbonate	170(i)	GMP	256
		Calcium sulphate	516	GMP	256

		Carob bean gum	410	GMP	256
		beta – Carotenes , vegetable	160a (ii)	1,000 mg/kg	211
		Carrageenan	407	GMP	256
		Citric acid	330	GMP	256
		Disodium 5'-Guanylate	627	GMP	256
		Disodium 5'-Inosinate	631	GMP	256
		Disodium 5'-Ribonucleotide	635	GMP	256
		Distarch Phosphate	1412	GMP	256
		Fumaric acid	297	GMP	256
		Gellan gum	418	GMP	256
		Guar gum	412	GMP	256
		Gum Arabic	414	GMP	256
		Karaya gum	416	GMP	256
		Konjac flour	425	GMP	256
		Lactic acid L-, Dand DL-	270	GMP	256
		Lecithins	322(i)	GMP	256
		Malic acid	296	GMP	256
		Mannitol	421	GMP	256
		Microcrystalline Cellulose	460(ii)	GMP	256
		Mono- and diglycerides of fatty acids	471	GMP	256
		Monosodium Lglutamate	621	GMP	256

		Nitrous oxide	942	GMP	256
		Pectins	440	GMP	256
		Phosphated distarch phosphate	1413	GMP	256
		POLYSORBATES		5,000 mg/kg	
		Potassium Alginate	402	GMP	256
		Potassium Carbonate	501(i)	GMP	256
		Potassium Chloride	508	GMP	256
		Processed eucheuma seaweed	407a	GMP	256
		Pullulan	1204	GMP	256
		Salts of myristic, palmitic and stearic acids with ammonia,calcium, potassium and sodium	470(i)	GMP	256
		Sodium acetate	262(i)	GMP	256
		Sodium alginate	401	GMP	256
		Sodium ascorbate	301	GMP	256
		Sodium carbonate	500(i)	GMP	256
		Carboxymethyl Cellulose	466	GMP	256
		Sodium gluconate	576	GMP	256

		Sodium hydrogen Carbonate	500(ii)	GMP	256
		Sodium lactate	325	GMP	256
		Tara gum	417	GMP	256
		Tragacanth gum	413	GMP	256
		Xanthan gum	415	GMP	256

4.2 Food Safety

Part I - General Hygienic and Sanitary practices to be followed by Petty Food Business Operators applying for Registration (See Regulation 2.1.1(2))

SANITARY AND HYGIENIC REQUIREMENTS FOR FOOD MANUFACTURER/ PROCESSOR/HANDLER

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

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

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

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

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

5. The floor and skirted walls shall be washed as per requirement with an effective disinfectant the premises shall be kept free from all insects. No spraying shall be done during the conduct of business, but instead fly swats/ flaps should be used to kill spray flies getting into the premises. Windows, doors and other openings shall be fitted with net or screen, as appropriate to make the

premise insect free The water used in the manufacturing shall be potable and if required chemical and bacteriological examination of the water shall be done at regular intervals at any recognized laboratory.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.3 Labelling Standards

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

1. Name, trade name or description
2. Name of ingredients used in the product in descending order of their composition by weight or volume
3. Name and complete address of manufacturer/packer, importer, country of origin of the imported food (if the food article is manufactured outside India, but packed in India)
4. Nutritional Information
5. Information Relating to Food Additives, Colours and Flavours
6. Instructions for Use
7. Veg or Non-Veg Symbol
8. Net weight, number or volume of contents
9. Distinctive batch, lot or code number
10. Month and year of manufacture and packaging
11. Month and year by which the product is best consumed

12. Maximum retail price

Wherever applicable, the product label also must contain the following:

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

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

All declarations may be: Printed in English or Hindi on a label securely affixed to the package, or Made on an additional wrapper containing the imported package, or Printed on the package itself, or May be made on a card or tape affixed firmly to the package and bearing the required information prior to customs clearance.

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

According to the FSS Packaging and Labeling Regulation 2011, "prepackaged" or "pre packed food" including multi-piece packages, should carry mandatory information on the label.

Contact Us

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