UNIT 15 COARSE GRAINS – VALUE ADDED PRODUCTS

Structure
15.0 Objectives
15.1 Introduction
15.2 Meaning of Value Addition
15.3 Value Added Products
15.4 Factors Contributing to Quality Assurance
15.5 Bureau of Indian Standards
15.6 Export Promotion
15.7 PFA
15.8 Consumer Protection Act
15.9 Let Us Sum Up
15.10 Key Words
15.11 Answers to Check Your Progress Exercise
15.12 Some Useful References

15.0 OBJECTIVES

After reading this unit you should be able to
- know the pattern of consumption of maize and other coarse grains.
- understand the meaning of value addition and have knowledge of various value added products.
- learn various processing methodologies for the production of value added products.
- have knowledge of packaging requirements and regulatory agencies for production of value added products.

15.1 INTRODUCTION

You have learnt from the previous lessons that maize, jowar, bajra, ragi and other small millets (kodo, little, foxtail and barnyard millets) are generally termed as “Coarse grains”. These grains occupy a very important place in the diets, particularly of the poorer sections of society. They also contribute significantly to the feed

Fig. 1: Pattern of utilization of Maize and Jowar in India
Milling of Maize

requirement of cattle and poultry in the country. Nearly 40% of maize and 60% of jowar grown in the country are used as feed components. About 5% of maize and jowar are also used for industrial purposes to produce starch and starch based products and also in brewing, as shown below:

For food uses they are normally ground into whole meal flours and are used for making roti, chapatti, ganji, (gravy) or mudde (dumpling). A small quantity is also used as puffed grains (particularly maize and ragi). Following is a list of few traditionally consumed products prepared from these grains:

Table 1: Traditional products prepared from coarse grains

<table>
<thead>
<tr>
<th>Traditional food</th>
<th>Coarse grains generally used</th>
<th>Description and variations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roti, bhakri</td>
<td>Maize, jowar, bajra, ragi</td>
<td>Pancake type product (also some times described as unfermented flat bread) prepared from debranned grain flour (maize, jowar, bajra and ragi)</td>
</tr>
<tr>
<td>Mudde, (dumpling)</td>
<td>Ragi</td>
<td>Coarse flour (sieved to remove the bran to some extent) made into a stuff porridge and later moulded and shaped. Mainly prepared from ragi (finger millet) flour.</td>
</tr>
<tr>
<td>Ganji, kheer, payasam (Porridge)</td>
<td>Small millets (saame and navane)</td>
<td>Thick or thin porridge like product prepared from finely ground flour (sieved to remove bran) this a product prepared usually from smaller millet grain like foxtail (navane), proso millet (samai) and kodo (vargu) millets</td>
</tr>
<tr>
<td>Popped / parched grains</td>
<td>Maize, ragi (some small millets are becoming popular now)</td>
<td>The grain subjected to high heat (240° to 270°C) for a short time (10 to 15 sec.), usually in a sand medium. This is a whole grain product containing bran. Variety specific and prepared commonly from maize and ragi.</td>
</tr>
<tr>
<td>Germinated and malted flours</td>
<td>Ragi Barley</td>
<td>Soaked grains are sprouted under standard conditions for specified times, followed by Kilning and devegetation. This is often mixed with sprouted green gram flour prepared similarly and used as weaning food for growing children.</td>
</tr>
<tr>
<td>Breakfast cereals</td>
<td>Corn/Maize</td>
<td>Maize (grits) specially prepared are cooked with various ingredients like malt extract, sugar and salt and tempered, followed by flattening to thin flakes. Flakes are toasted at high temperature (around 280°C) for just about 10 seconds. This product is used as breakfast cereal.</td>
</tr>
</tbody>
</table>
Though these grains are consumed traditionally over centuries, no special processing is normally given to them before consumption and therefore we don’t see many value added products from these grains, as we see from wheat and rice, in the market. Perhaps main reasons for this situation seem to be the following:

- Their crude fibre content (mostly indigestible matter) is high. Outer most layers in many of them are physically coarse, fibrous in nature and are unpalatable (hence the name “Coarse grains” also)
- They cannot be easily cooked to soft textured product like rice, as the outer layers in these grains appear to be quite resistant to hydration (water uptake)
- Most of them have strong and characteristic colour and odour (For ex. Brown colour of ragi, bluish-grey colour of bajra and their strong flavours)
- These do not have gluten protein (as present in wheat) and therefore do not lend themselves to products like chapatti, bread and other baked products.
Milling of Maize

- For the same reasons cited as above they are not well suited for preparation rice based products like snack foods (chakli, thengolal, sandige and other deep fried products)

There is therefore, a great need for improving the consumer acceptability of these grains, through the production of processed products (value added products), so that they can be consumed by all sections of the population. However, since these are expected to be consumed by the middle and lower middle class population, suitable processing methods which would not be sophisticated and expensive, need to be thought of for the production of value added products from these low cost food grains.

15.2 MEANING OF VALUE ADDITION AND NEED FOR PROCESSING OF COARSE GRAINS

Value addition is a process by which the coarse grains are made more palatable and acceptable to the consumers. It could be simple grinding and sieving to reduce the content of coarse husk or it could be dehusking and debranning to obtain pearled grain and flour from it. Pearled grain / flour so obtained could further be processed to prepare various products like noodles, flakes to provide a variety of products to the consumer and add value to these grains.

Table 2: Benefits of value addition to coarse grains

<table>
<thead>
<tr>
<th>Who benefits from value addition</th>
<th>What is value addition to the concerned group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer</td>
<td>• Palatable and better consumer acceptance</td>
</tr>
<tr>
<td></td>
<td>• Variety of processed products to choose from (pearled grains, shelf stable flours, snack foods, etc.)</td>
</tr>
<tr>
<td></td>
<td>• Convenience products (ready-to-prepare and ready to eat types-snack foods, papads etc.)</td>
</tr>
<tr>
<td></td>
<td>• Time and energy saving for preparation at home.</td>
</tr>
<tr>
<td></td>
<td>• Nutritional and health benefits (low fat, high protein / fibre, sugar free etc.)</td>
</tr>
<tr>
<td>Food processor (industry)</td>
<td>• High opportunities for processing &amp; value addition</td>
</tr>
<tr>
<td></td>
<td>• Product innovation and market development</td>
</tr>
<tr>
<td></td>
<td>• Value addition helps in growth of the industry and job creation (direct and indirect)</td>
</tr>
<tr>
<td></td>
<td>• Development of shelf-stable products, provides opportunity to reach out far-off markets and even exports (particularly Health foods)</td>
</tr>
<tr>
<td>Farmers</td>
<td>• Ready market for their produce</td>
</tr>
<tr>
<td></td>
<td>• Higher returns for quality produce with contract farming (tie up with industry)</td>
</tr>
</tbody>
</table>

Processing and value addition to coarse grains will benefit the non-habitual consumers by improving the taste appeal (to those accustomed to rice and wheat), besides being useful in extending the availability of food grains. Apart from this production of value added products would provide variety and diversification of food habits and also provides an opportunity to produce more nutritive products (say, through malted grains) which could form part of health foods.
## 15.2.1 Changed during processing

Coarse grains need to be processed for production of value added products. Let us now look at the significance of grain constituents to products and changes that take place during processing Table 3.

### Table 3: Significance of grain constituents in relation to products

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Proportion in the grain (%)</th>
<th>Significance in products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starch</td>
<td>62 to 75</td>
<td>- Grains store energy in the form of starch and happens to be an important source of energy in the diet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Starch affects many physical properties of foods</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Thickening of gravies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Gelling of puddings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Expansion / volume increase on heating (puffing)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Preparation of glucose / fructose syrups due to the action of enzymes (α &amp; β amylases on starch)</td>
</tr>
<tr>
<td>Protein</td>
<td>6 to 12</td>
<td>- Naturally occurring polymers containing peptides and amino acids and an important nutrient in our diet.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Among all the cereal flours, only wheat flour has the ability to form a strong, cohesive dough that retains gas and hence produces a light, aerated baked product. Protein is probably the most important factor in bread flour quality. Other cereal proteins do not have this type of gluten proteins and hence are not suitable for bakery foods like bread and biscuits. Coarse grains can only be used partially (with wheat) in bakery products.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Proteins possess a three dimensional structure and this determines its properties. When this structure is altered or destroyed by heat or pH, the protein is said to be denatured and many properties are lost.</td>
</tr>
<tr>
<td>Non-starch polysaccharides (NSP)</td>
<td>8 to 15</td>
<td>- Cellulose, hemi-celluloses and pentosans constitute NSP.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Cellulose is the major component of straw, fodder and hulls. Pericarp of cereal grains are quite rich (can go up to 30%) in cellulose while there is very little in the endosperm (less than 0.3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Hemicellulose and pentosans make up cell walls and cementing materials that hold cells together.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- They are soluble in water and lose their structure on heating (like cooking) and cells fall apart, disturbing the main structure of the grains.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- They also constitute major portion of the dietary fibre of the diet, which helps in digestion of the food and excretion of the faecal matter from the body.</td>
</tr>
</tbody>
</table>
### Milling of Maize

<table>
<thead>
<tr>
<th>Lipids</th>
<th>2 to 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Defined as materials soluble in organic solvents.</td>
<td></td>
</tr>
<tr>
<td>• Constitute a large number of compounds made up of fatty acids. They may be free or bound.</td>
<td></td>
</tr>
<tr>
<td>• Functionally lipids play important role in product texture and keeping quality. Lipids are broken down by enzymes (lipases) resulting in compounds that contribute to off-flavour in the stored products, particularly ground cereals. This is significant in coarse grains like maize, bajra and foxtail millet.</td>
<td></td>
</tr>
</tbody>
</table>

**Starch**

The changes that starch undergoes when it is heated with water are responsible for the unique character of many of our foods:

- Obvious examples are viscosity and mouth feel of gravies, porridges and puddings.
- With hydration starch can hold water up to 30% of its own weight. But when heated starch takes more water and swells substantially starch is said to be cooked.
- When a cooked starch paste is allowed to cool, it forms a gel (a liquid system that has properties of a solid).
- When a starch-gel is frozen and thawed, the starch chains have a tendency to interact strongly with each other and force the water out of the system, this is known as “Weeping of the gelly” or “Syneresis”. Longer storage of such a gel leads to more interaction between the starch granules and eventually to the formation of crystals. This process is known as “retrogradation”.
- When starch is heated in limited water (as in roasting) there is much less swelling and changes are very slow.

**Proteins**

Protein occurs in three dimensional structure that determines its properties. When this structure is destroyed or altered, the protein is said to be “denatured” and occurs when protein is heated in an aqueous medium.

Alteration of pH and treatment with various reagents can also cause proteins to be denatured.

Proteins also become less soluble as a result of denaturation.

### 15.3 VALUE ADDED PRODUCTS

Let us now look at some of the value added products that can be prepared from the coarse grains

First and foremost is production of refined flours. It is well known to all of you, that we generally get the grains (ragi, jowar and maize) ground in a street corner flour mill, generally a plate mill (also known as chakki), and sieve the ground flour to remove some (may be about 5 to 10% of whole flour) of the husk / bran portion. Such a flour as you all know is used to make mudde (dumpling) and roti. As you can easily visualize, such a simple ground flour would still contain a significant portion
of bran or husk and would still give a "coarse" feeling on the tongue in the prepared products. To overcome this problem, a simple technique of moistening the grain prior to grinding has been standardized at CFTRI. In this process a small amount of water (about 2 ml to 4 ml per 100g of the grain) is sprinkled on the grain and mixed. The grain so wetted is ground in the plate grinder (chakki) after about 5 to 10 minutes. By this technique the outer bran / husk layer becomes so wet, that it does not become powder during grinding and hence can be easily sieved out to obtain “Husk-free” flour. A “Mini grain mill” has also been developed for this purpose, which has already been explained to you in an earlier lesson.

Parboiled and pearled grains to cook like rice: Parboiling is a traditional process practiced in India for paddy. The process was perhaps evolved to harden the grain and reduce breakage during milling, so that greater proportion of ‘head’ rice could be produced during milling. This process has recently been adopted to harden the endosperm of coarse grains and has been successfully achieved in the case of grains like ragi (finger millet), same (proso millet) and navane (foxtail millet) following are the essential steps in the process:

1. Whole grains (Coarse grains)
2. Soak
3. Drain out excess water
4. Steam
5. Dry to 10 to 12% moisture
6. Debran / pearl
7. Pearled grains
8. Ready to cook millet grains

Chart 1: Process for RTC pearled grains (Ragi and Small millets)

- **Shelf stable flours**, particularly from maize, jowar and bajra for preparation of products like roti, dumpling and porridge.
Chart 2: Process for production of shelf stable flours (Sorghum and Bajra)

Flakes from grains like maize and jowar: Corn flakes, is a well-known breakfast cereal in western countries. Such products, however, are not popular in India, though some flakes are being produced recently from maize and used as deep-fried and spiced flakes (*chewda*). Processes have now been standardized to produce plain flakes as well as ready to eat (RTE) flakes both sweat and savoury from grains like maize and jowar. This process can be adapted to all other coarse grains. Essential steps of this process are as follows:

Whole grains

Soak in hot water

Roast at high temp. (220 to 260°C) for shot time (40 sec to 1 min)

Dry the roasted grains

Mill to remove husk /bran and germ

Pearled grains & brokens

Grind & sieve

Mixed with additives

Shelf stable flours
Flake the grits or grains to desired thickness (~ 0.4 mm) in a roller flaker.

Plain flakes used for products like chewda, upma

Mix with desired ingredients

Dry at 60°C

Toast at 280°C for 10 sec

Cool

Pack

Ready-to-eat (RTE) flakes

Chart 3: Process for production of RTE Flakes (Maize and Sorghum)

**Corn products (western style):** Corn or maize has been used for centuries as a human food in south and central America. It is converted to products like Tortilla and Chips. Corn is first heated with water containing calcium hydroxide (about 0.5 to 1.0%). The temperature is brought to at least 82°C (and generally below the boiling point) and held there for about 1 hour. Corn so heated is kept in stoneware jars or in bulk and is allowed to cool slowly (generally overweight). This produces *nixtamal* (heat treated, alkaline-steeped corn), which is then thoroughly washed to remove the hulls and excess calcium hydroxide (lime).

- **CORN**
  - Heat with 0.5% Ca(OH)₂ 1 hr at 82°C

- **NIXTAMAL**
  - Ground on stone grinder

- **MASA (M.C. ~ 55%)**
  - Flatten, shape & bake
  - Extrude & fry

- **TORTILLA**
  - Temper, form and fry

- **CORN CHIPS**

- **TACO SHELL**

Chart 4: Corn products (Western style)
Subsequently it is ground by hand or mechanical stone mills. The resulting wet ground product is called ‘masa’. It contains about 55% moisture and forms slightly cohesive dough. Further, treatment with Ca (OH)₂ has two functions – firstly, it gives flavour and secondly the alkaline nature of Ca (OH)₂ weakens the outer layer of the corn pericarp so that it could be removed by washing. Following is the flow diagram of the process which is quite popular in Latin American countries and Mexico in particular:

**Pressure extruded pre-gelatinized products (maize, ragi)**

A. Vermicelli/noodles: Prepared generally from wheat. Other grains, including coarse grains cannot be extruded to strands due to lack of gluten type proteins in the flour. However by suitable hydro-thermal treatments (like cooking) can be used for preparation of good quality noodles.

```
Refined millet flour
↓
Cooked and made into dough
↓
Mix ingredients & knead
↓
Pressure-extrude to noodles and dry
↓
Dried noodles
```

**Chart 5: Process for noodle preparation (Maize and Ragi)**

B. Chips

```
Refined Maize flour (approx. 44 mesh BSS)
↓
Mixed with additives like hydrogenated fat, salt, desired spices, cooking soda, An-antioxidant (BHA/BHT) and a bonding agent
↓
Made into a Dough with about 45 to 50% water
```
Steam cook

Pressure extrude like ribbons / sheets and cut to size

Dry it a round 60°C for about 2 Hr.

**Dried chips** (Can be fried in oil or baked in microwave oven to obtain crisp snack)

**Chart 6: Process for production of chips (Maize and Ragi)**

- **Deep fried snack products** *(bajra, ragi, jowar and small millets)* Chakli, Thengolal, Papad, Sandige

  Maize grits / pearled grains

  Wash

  Partially dry and grind to flour

  Mix with roasted black gram flour (and rice flour – optional)

  Ready mix for snack product

  Prepare dough, extrude & deep fry/bake

  Baked/ Fried snack food
  *(chakli / tengolal)*

**Chart 7: Process for snack foods (maize and Ragi)**
**Papad:**
Refined flour

Cook as slurry (with additives (salt & NaHCO₃))

Make stiff dough with flour (water 1:2.5)

Knead & make to small balls (add other ingredients)

Sheet by Hand roll / in a press

Dry in shade to about 14-15% moisture

*Chart 8: Process for production of papads (Ragi)*

**Sandige:**
Refined flour

Cook well as a thin slurry

Cool

Spread on a cloth

Dry in sun

Cool and take out from cloth

Dry further in shade

Sandige

*Chart 9: Process for pre-gelatinized products (Sandige – Ragi)*
- **Extrusion cooked products** – all grains, particularly after refining to produce low fat snack foods
  
  Grain flour + other ingredients & water
  
  Conditioning
  
  Extrusion cooking (twin screw extruder)
  
  Expanded extruded products
  
  Cutting
  
  Coating (desired spices & flavours)
  
  Drying
  
  Packing
  
  RTE type extruded snack products

  **Chart 10: Process for extruded RTE Type Snack foods**

- **Health foods** – particularly ragi & few small millet grains (malted weaning food)
  
  Finger millet (Ragi) 70% + Wheat 915% + Green gram (15%)
  
  Soak for 12 to 16 hours (overnight)
  
  Sprout for 48 hours for Ragi and wheat and 24 hours for green gram
  
  Sunday / Dry in oven / drier at 60°C
  
  Remove rootlets (Devegetate)
  
  Sprouted grains
  
  Kiln / toast at 60°C for 10 min.
  
  Sprouted & kilned Ragi
  
  Condition with 5% water
  
  Grind wheat and green gram separately, sieve to remove the bran / husk
Milling of Maize

Hold for 10 min. (Tempering)

Mill in plate grinder

Sieve to remove bran through 60 mesh

Ragi (Finger millet) malt powder

Mix in proportions indicated

Add other ingredients sugar, flavourings etc. blend well

Malted Weaning Food

Chart 11: Process for Malted weaning foods (Ragi-based)

- **Puffed grains** – jowar, ragi and other small millet grains salted and spiced puffs, cereal bar - Chikki type products.

Whole grains

Destone and clean

Roast in sand medium at high temp. short time (10 to 15 sec.) (260 to 280°C)

Sieve to Remove sand Puffed grain

Salt / spice coating

Low fat Snack product

Chart 12: Process for puffed RTE type snack foods

- Partial substitution (upto about 50%) in rice based fermented foods – idli and dosa

- Partial substitution (upto about 10 to 20%) in wheat based bakery products – Ex. Ragi bread & biscuits. Other small millet grain flours could also be used at around 15 to 20% in the bakery products.

**Processing of oat and barley:** Though these grains are not so widely grown in India, they are finding used in baby foods and foods of health significance. Oat and barley are also classified as coarse grains, because of their grain structure. Oats are harvested within their hulls. Hulls represent about 25% of the grain and dehulled oats are called “groats” and resemble wheat grains in appearance. Oat groats are richer in fat and protein compared to other cereal grains and good sources of several enzymes, including fats splitting lipases. Therefore unless properly processed the milled oat products would have short shelf life.

Oats are generally heat treated and dried. The heat treatment generally consists of
heating the oats for about one hour in large open pans heated with steam. The grains reach a temperature of about 93°C and loose 3 to 4% moisture. A slightly roasted flavour develops (which is considered desirable). Heating also makes the hulls more friable and helps in their removal. In addition the fat splitting lipolytic enzymes are also inactivated providing shelf stability to the products (groats and flour). Heat treated oats are dehulled in an impact type huller to obtain groats. The groats are then further processed into rolled (flaked) oats by streaming followed by passing through the roller flaking machine. Rolled oats are used to produce quick cooking oats and are finding increased use in baby foods and breakfast cereals in western markets.

Barley is another important coarse cereal. Its main use is in malting and to some extent as a feed ingredient. A small portion is also pearled. The hull of barley is strongly attached to the pericarp and therefore it is difficult to dehull by the techniques used for rice or oats. Pearling is generally achieved by abrading away the outer surfaces of the grain with an abrasive surface (like emery disc or cones as in rice polisher). Pearled barley is a common ingredient in soups. It is also converted to flour and used in baby foods, breakfast cereals and as a thin porridge (gravy) as a medicinal drink.

Value addition achieved on processing of coarse grains to produce various value added products

<table>
<thead>
<tr>
<th>Value added products</th>
<th>Approx. value addition (%) on the price of raw grain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refined miller flour (raw)</td>
<td>20</td>
</tr>
<tr>
<td>Shelf stable millet flour (processed)</td>
<td>50 to 80</td>
</tr>
<tr>
<td>Flaked grains</td>
<td></td>
</tr>
<tr>
<td>(a) Plain</td>
<td>100</td>
</tr>
<tr>
<td>(b) RTE type</td>
<td>200 to 300</td>
</tr>
<tr>
<td>Extrusion cooked products (low fat snacks)</td>
<td>200</td>
</tr>
<tr>
<td>Deep fried snack products</td>
<td></td>
</tr>
<tr>
<td>(a) Ready mix</td>
<td>60 to 100</td>
</tr>
<tr>
<td>(b) Prepared RTE snack</td>
<td>100 to 150</td>
</tr>
<tr>
<td>Puffed grains</td>
<td></td>
</tr>
<tr>
<td>(a) Plain</td>
<td>50 to 100</td>
</tr>
<tr>
<td>(b) RTE type</td>
<td>150 to 200</td>
</tr>
<tr>
<td>Health foods</td>
<td>&gt;200</td>
</tr>
</tbody>
</table>

15.4 FACTORS CONTRIBUTING TO QUALITY ASSURANCE OF VALUE ADDED PRODUCTS

Consumers demand safe, reliable and high quality products at reasonable prices. They remember and continue to buy products which have consistent quality and perceived value. Therefore it is necessary for the food processing units, big or small, to maintain uniform quality and keep improving the same as per consumer needs from time to time. For this, reason the food processor should be aware of critical points in processing for issues of hazard in products and final product quality as well as factors contributing to the same. These can be summarized as follows:
Table 5: Factors controlling quality of processed food products

<table>
<thead>
<tr>
<th>Critical points to be checked</th>
<th>Check points to monitor</th>
<th>Measures to check the hazardous issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microbial safety (Safe moisture)</td>
<td>Quality of all ingredients (Grains, additives like salt, fat/oil, sugar and others)</td>
<td>Analysis upon arrival Maintenance of data records</td>
</tr>
<tr>
<td>Proper inventory and stock management. Ensure first in first out – (FIFO-system)</td>
<td>Pre-production storage (Optimal conditions)</td>
<td>Measures to avoid contamination and infestation</td>
</tr>
<tr>
<td>Quality evaluation (Sensory, texture, effect of transportation and distribution upto the consumer outlets, &amp; storage)</td>
<td>Proper cooling and packaging product information and nutrition labeling</td>
<td>Labeling for batch number, date of manufacture and declare “Best before” for assured quality in the final product till it reaches the consumer and finally consumer.</td>
</tr>
</tbody>
</table>

There are many programmes developed to implement the quality assurance (QA) in food products. These include Good Manufacturing Practices (GMP), Hazard Analysis and Critical Control Points (HACCP). Many industry specific programmes (ISO-9000 series) aimed to enhance quality of products and services, production efficiency and involvement and motivation of all employees. Specific QC programmes developed for design, development, production and services (ISO 9001 and 9002), final product inspection and testing (ISO 9003), guidelines for continued quality improvement (ISO 9004) and management of environmental issues (ISO 14000). In addition, a knowledge of Food Regulatory Agencies is a must for any food manufacturer. These include the following:

15.5 BUREAU OF INDIAN STANDARDS (BIS)

This organization (which was earlier known as ISI) deals with quality standards of various food articles and prepared National Standards for them in consultation with the experts in the country. The certification scheme under BIS is a voluntary one and any manufacturer who wants to use the BIS mark on their food product may apply for the same to the authorities. The authorities after inspection and other formalities permit the manufacturer to use the BIS mark on their product. BIS mark on any product is a symbol of quality and helps in gaining consumer confidence.

15.5.1 Agricultural Produce (Grading and Marketing) Act (AGMARK)

This is one of the oldest Food Laws promulgated in the country and administrated
by the Directorate of Marketing and Inspection. Agricultural produce includes all Agricultural and Horticultural product and all articles of food and drinks manufactured from them. Any organization or parker who wants to use “AGMARK” symbol on the label on the containers can apply to the authorities. The authorities after inspection and ensuring that the necessary facilities like equipment, laboratory etc. are available, allow them to use “AGMARK” symbol which ensures the quality standards laid down for that product have been complied with. This gives quality assurance to the consumers.

15.6 EXPORT PROMOTION (QUALITY CONTROL AND INSPECTION) ACT

This act is intended to provide for sound development of export trade from ‘India under this act, the Expert Inspection Council of India is exercising quality control and pre-shipment inspection on export-oriented commodities including food grains and maize products.

15.7 PREVENTION OF FOOD ADULTERATION ACT (PFA)

The prevention of Food Adulteration Act (FPA) was promulgated in 1954 and is primarily intended to check adulteration in food stuffs and make available pure food materials, devoid of adulterants and contaminants, to the population at large. The act covers a wide range of ingredients like natural / coal tar food colours preventatives, antioxidants, emulsifying and stabilizing agents, heavy metal contaminants and pesticides. A Central Committee for Food Standards (CCFS) constantly reviews the standards and revises from time to time. PFA act formulated at the central level have to be implemented at the levels of State Governments and local bodies.

15.8 THE CONSUMER PROTECTION ACT 1986

This act operated by the Ministry of Food and Civil supply was enacted recently. Here consumers can play the role of Food Inspector, though recognized consumer redressal organizations, in the case of adulterated samples.

We can conclude that Food Manufacturer (producers of value added products) ought, to have knowledge of consumer needs, follow Good Manufacturing Practices (GMP) and deliver quality products to the consumer. This only ensures sustained market for their products.

15.9 LET US SUM UP

In the present lesson you have learnt about

- Various forms in which the coarse grains are consumed.
- Meaning of value addition and different value added products (noodles, flakes, pearled grains, extruded snack foods, papads, etc).
- Different processing steps like puffing, germination and malting, parboiling, debranning and pearling, and flaking and their application in the preparation of value added products from coarse grains.
- Concepts of quality assurance and critical points in production of value added products.
- Knowledge of various regulatory agencies that is essential for quality monitoring, marketing support and consumer confidence.

Check Your Progress

Note:  
   a) Use the space given below for your answers.  
   b) Check your answers with those given at the end of the unit.

1. How are coarse grains traditionally consumed in India?

2. What are the constraints in the consumption of coarse grains?

3. What is value addition to coarse grains?

4. What are the main constituents of coarse grains?

5. What are the value added products that could be prepared from coarse grains?

6. What are the factors that contribute to the quality of value added products?

7. What are the various agencies that help in quality assurance of value added products?
8. How manufacturers of food products can maintain good quality in value added products?

15.10 KEY WORDS

Coarse grains : Grains like maize, (corn), sorghum (Jowar), Bajra (pearl millet), Ragi and other small millets

Value addition : Increasing the value that could be earned for a raw material (coarse grain) through processing and production of products.

Germination : Sprouting of soaked grains under controlled conditions. Sprouting is stopped when shoots of about 3-5 mm are developed.

Kilning : This is a process of toasting (generally at 60°C) the sprouted grains to develop characteristic aroma and enzyme activation which normally takes about 15 min. Germination / sprouting combined with kilning referred to as “malting”.

Pearled grain : Grain from which the outer pericarp layer (also known as husk / bran) is removed by an abrasive action.

Shelf stable flour : This is a product generally prepared by grinding the grain in which the lipolytic enzymes have been inactivated by hydrothermal treatment.

RTE Products : These are products which do not need preparation for consumption at the consumer end (ready to eat)

Breakfast cereal : These are processed low fat grain products (generally RTE type) recommended for consumption at breakfast time. Good examples of such products are sweetened RTE type flakes. Cornflakes are popular in this category.

Snack food / product : These are food products designed for consumption during Tea time. Generally these are baked / coated extrusion cooked products or deep fat fried foods.

15.11 ANSWERS TO CHECK YOUR PROGRESS EXERCISE

1. Coarse grains like maize, jowar, bajra, ragi and small millets are consumed in India mainly as roti, mudde (stuff porridge) and ganji (thick or thin gruel – porridge).
2. As the name itself indicates they are coarse and harsh on the tongue. This is due to the coarse outer layers (husk / bran) in these grains, it is difficult to cook them to soft textured product like rice. Since they do not contain gluten type protein they are not suitable for preparation of products like bread, biscuits and other bakery products. Some of these grains are highly coloured (ex. Ragi) and have strong characteristic flavour (ex. Bajra)

3. Value addition is a process by which the coarse grains are made more palatable and digestible. Hence their acceptability to consumers is improved by value addition. ‘Refining’ and preparation of various products through processing, which also increases their value and marketability.

4. Starch, protein, non-starch polysaccharides (NSP) and lipids are the main constituents of the coarse grains. Starch constitutes about 60 to 75% of the grain while protein accounts for about 6 to 12% in various coarse grains. These constitute major sources of energy in the diet. Lipids (fat) accounts for about 2 to 5% of the grain and is significant in the keeping quality of the flour prepared from these grains. Husk / bran layer of pericarp is rich in NSP like cellulose and hemicelluloses. They contribute to major dietary fibre content of the diet.

5. Various value added products that could be prepared are refined flours, pearled grains, noodles, flakes puffed grains and extrusion cooked products. Value addition ranging from about 20% to 200 % could be achieved through various value added products.

6. Factors like quality of raw materials (grains, additives, etc.) processing parameters (moisture, temperature and time) and good manufacturing practices (GMP) contribute to the quality of products.

7. Agencies like Bureau of Indian Standards (BIS), Agricultural Produce Grading and Marketing Act (AGMARK), Prevention of Food Adulteration (PFA) and Consumer Protection Act (CPA) help in quality assurance and monitoring of the value added products. While BIS mark on any product is a symbol of quality, PFA and CPA serve as watch-dogs of quality and protect consumer interests in processed products.

8. Food manufacturers should resort to good manufacturing practices (GMP) and should be aware of techniques of hazard analysis and keep a check on critical points (HACCP). This only ensures production of quality value added products and ensures sustained marketability and consumer demand.

15.12 SOME USEFUL REFERENCES


