

**PROCESSING  
TECHNOLOGY OF CEREALS  
ASFE 2201**

**SUDIPTA BEHERA  
ASSISTANT PROFESSOR, SoABE**

# **MALTING OF CEREALS**

- ✓ **Barley** is commonly used for malting in many countries.
- ✓ Other grains like **wheat, sorghum and ragi**
- ✓ **Malting steps:**

(1) **selection** of the grain and cleaning,

(2) **steeping** of the grain in water,

(3) **germination** of the steeped grain in trays or drums,

(4) **controlled slow drying** of the germinated grain (kilning) and

(5) **removal of rootlets** by cleaning on wire mesh.

## 1. Selection of the grain and cleaning:

- ✓ The grain should be of good quality and free from **infestation**.
- ✓ The seed selected should **have high germination capacity**.
- ✓ The grain is cleaned of all **impurities and graded to remove undersize grains**.

## 2. Steeping :

- ✓ The grain is steeped in cold water for 36 hours in warm climate with two or three changes of water.
- ✓ The steeping may have to be for longer periods-(48 to 72 hours) in cold climates.

### 3. Germination (couching) :

- ✓ The steeped grain is spread on wire mesh, trays of 2-3 inch thickness which are kept in a stand.
- ✓ The germination is allowed to proceed for 3 days in a warm climate.
- ✓ In colder climate, longer periods may be required for germination (4-6 days).
- ✓ The grains are mixed up once in 24 hours and water is sprinkled over them.
- ✓ The room in which the trays are kept is aerated by blowing moist air at a slow rate.
- ✓ During germination, amylases and proteinases are formed.

#### **4. Kilning (Slow drying):**

- ✓ Efficient kilning consists of, drying the germinated grain at a slow rate.
- ✓ During slow drying, the amylases act on starch, hydrolyzing it to dextrins and proteases which acts on proteins, hydrolyzing them to proteases and peptones.
- ✓ The drying should be at a low temperature with a view to conserve as much of the enzyme activity as possible.
- ✓ Usually, the temperature is slowly raised to 140°F (60°C) during the course of 6-10 hours from the time the wet malt is loaded for kilning.
- ✓ During kilning, the water-soluble carbohydrates and nitrogen (peptones and peptides) increase.
- ✓ The characteristic malt flavour is developed.
- ✓ The malt is dried to a moisture content of about 13 per cent.

## Uses of malt

- ✓ Malt is used in **brewing** and in the preparation of malt extract for **pharmaceutical purposes** and in the preparation of, **malting milk powder**.

# Brewing:

Steps involved in the preparation of beer from malt are as follows

## 1. Mashing:

1. Mashing of powdered malt with gelatinised wheat flour in water at 37- 40°C
2. Filtration and clarification of the extract
3. Addition of hops to extract and boiling.
4. Cooling of extract and fermentation of wort (extract) by yeast at controlled temperature (46-52°F)
5. Filtration and storage of beer
6. Pasteurisation, bottling and carbonation





# Malt extract

Steps involved in the preparation of malt extract are as follows :

## 1. Mashing:

- ✓ Powdered malt (from malted barley or sorghum or ragi) is suspended in 8 times the weight of water at 35-40°C.
- ✓ The mixture is transferred to the mashing tank and is mixed with a suspension of powdered malt in water.
- ✓ Mashing is carried out by raising the temperature of the mixture to 40-50°C for 2 hours and 55-60°C for 1 hour.
- ✓ During this period the **amylolytic enzymes** of malt act on the starch and **convert it into dextrins** and **maltose** and the proteases act on proteins.

## 2. Filtration :

- ✓ After the mashing is complete, the unreacted material is removed by centrifuging the mixture in a basket centrifuge.
- ✓ The malt extract thus obtained contains about 15 per cent solids.

## 3. Concentration :

- ✓ The clarified malt liquor obtained above is concentrated, under vacuum in a **falling film evaporator** to 40-50 per cent total solids.
- ✓ Further concentration to 78-80 per cent total solids is effected in a standard vacuum pan.
- ✓ The malt extract thus obtained is a thick viscous light brown product with a pleasant aroma and taste.

**4. Packaging :** The malt extract is packed in tins of 25 lbs capacity.

# **BREAKFAST CEREAL FOODS**

- ✓ **Ready-to-serve breakfast** cereal foods are manufactured in different countries and have become quite popular.
- ✓ These include
  - ✓ (1) flaked breakfast cereals,
  - ✓ (2) puffed breakfast cereals,
  - ✓ (3) shredded and granular breakfast cereals and
  - ✓ (4) puffing by extrusion,.

## 1. Flaked breakfast cereals:

- ✓ The common cereal flakes commercially available are **corn flakes, wheat flakes, rice flakes and oat flakes**.
- ✓ The general methods of preparation of cereal flakes are as follows
  1. Milled whole or broken cereal grains are cooked in steam,
  2. Cooked cereal is flaked in a flaking roller and dried and
  3. The flakes are toasted and packed.

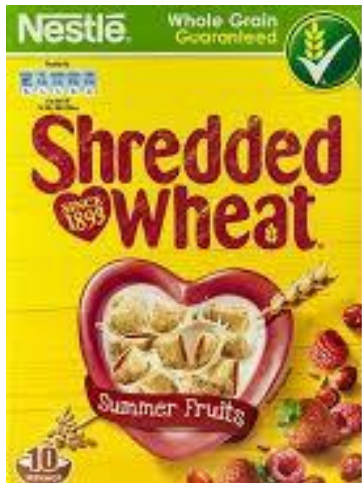
**Note:** During the preparation of the flakes, the nutritive value of the proteins is adversely affected and a part of **B-vitamins** present is destroyed.

## 2. Puffed breakfast cereals:

- ✓ The puffed breakfast cereals of commerce include those from wheat, rice, barley, corn etc.
  
- ✓ The process consists of the following steps:
  1. The grain is soaked in hot water till it absorbs about 20 per cent water and
  2. The moist grain is introduced into puffing guns and puffed.

### 3. Shredded breakfast cereals:

- ✓ The most popular representative of this class is shredded wheat.
- ✓ This is made from whole wheat which, is cooked in boiling water for 1 hour.
- ✓ It is partially dried and passed through shredding rolls.
- ✓ The shredded wheat is dried in an oven at 250°F for 30-60 minutes.



## 4. Granular breakfast cereals (grapenuts):

- ✓ The most widely used cereal granules are grapenuts.
- ✓ It consists of fragments of toasted bread.

The process manufacture is as follows:

- ✓ A stiff dough is made of a blend of wheat flour, malted barley flour, salt, bakers yeast and water.
- ✓ The dough is maintained at 80°F for 5 hour.
- ✓ The dough is formed into loaves and baked at 400° F.
- ✓ The baked loaves are fragmented by shredding knives or saws and the pieces are toasted at 250°F for 2 hours.
- ✓ The pieces are broken up into small granules and packed.





## 5. Puffing by extrusion (Wenger process) :

✓ Puffed breakfast cereal foods in many attractive shapes as well as many kinds of snacks are being manufactured by the Wenger process.

### ✓ The process steps:

1. The cereal flour blend is cooked into a stiff dough.
2. The dough is cooked under pressure of 30-40 pounds per square inch and temperature of 300-350°F and extruded through the die.
3. The extruded product is sliced off by revolving blades.
4. The dough pieces expand rapidly as they leave the die.
5. Since, they still contain about 26-27 per cent moisture, they are dried in a hot air drier.
6. The process can be used for preparing weaning foods by adding protein-rich foods, vitamins and minerals to the cereal flour.

# ASSIGNMENT

- Write about the different uses of malt in food processing.
- Write about the equipment used in extrusion.
- Write about brewing process.
- Write the advantages and disadvantages of malting.