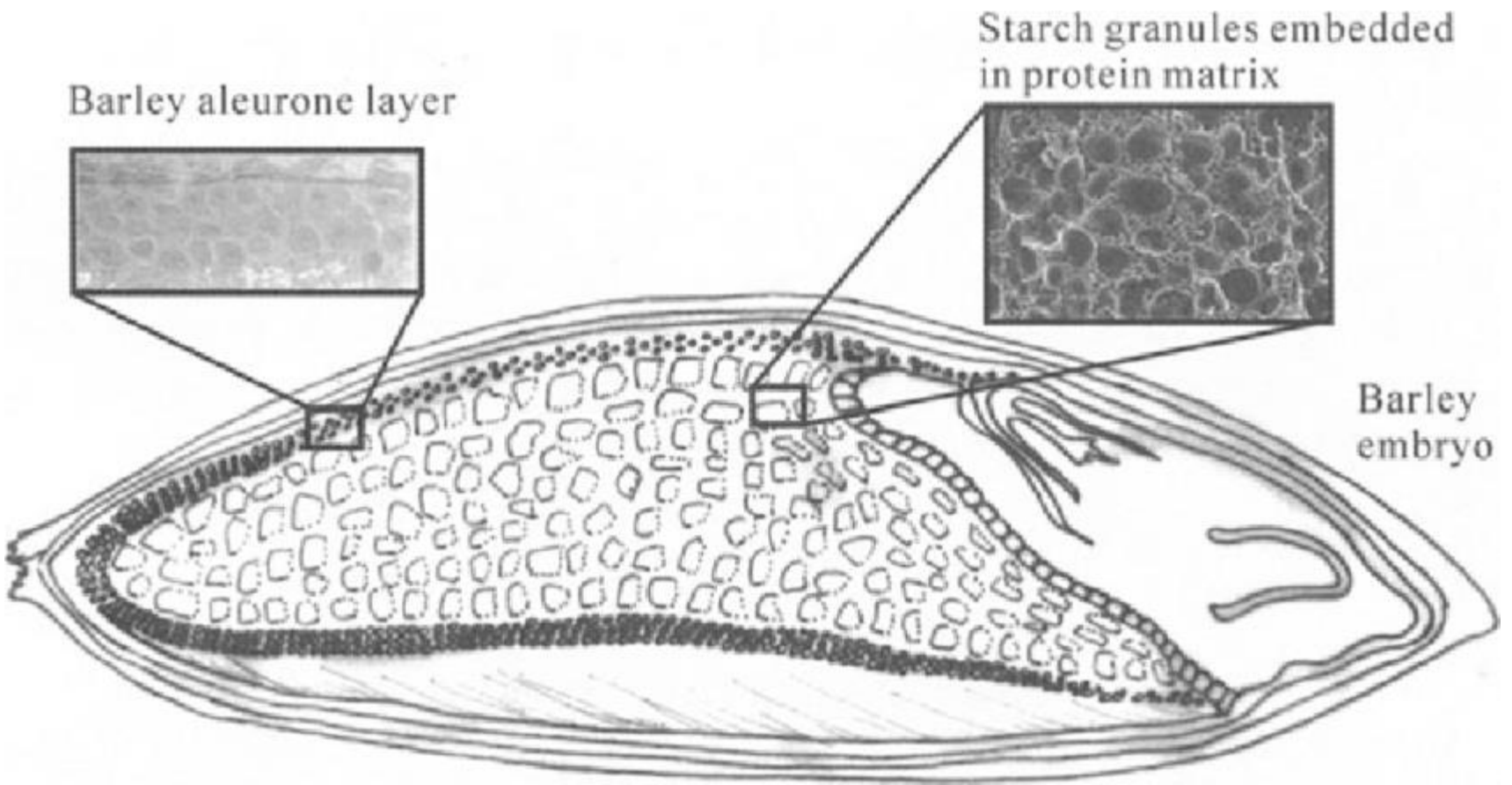


**PROCESSING  
TECHNOLOGY OF CEREALS  
ASFE 2201**

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# **MILLING OF BARLEY**





- ✓ Barley is used to a small extent as a food in the form of **pot barley or pearl barley or barley flour**.
- ✓ It is used mostly in the preparation of malt.
- ✓ Barley is used to a limited extent as a staple cereal in some parts of North India.
- ✓ Pot and pearl barley: Both pot and pearl barley are manufactured by gradually removing the **hull and aleurone layer** of barley kernel by abrasive action.
- ✓ Two types of machines are used. One type consists of a **cylindrical millstone which revolves at about 450 rpm**.
- ✓ The second type is **pearling machine consisting of 6 to 8 abrasive discs (coated with carborundum or emery)** which are rapidly revolving.

- ✓ The hull and aleurone layer of barley are removed by rubbing against the millstone or emery disc.
- ✓ The dehusked barley is subjected to pearling.
- ✓ After the third pearling, the bran is almost completely removed along with a part of the aleurone layer.
- ✓ At this stage, the product may be graded and sold as pot barley. When the grain is subjected to 5 to 6 pearling operations, the resulting pearl barley is small, round and white.
- ✓ One hundred kg of barley normally yields about 65 kg of pot barley or 35 kg of pearl barley.
- ✓ **Barley flour:** Pot barley or pearl barley is ground to fine flour and sold as barley flour

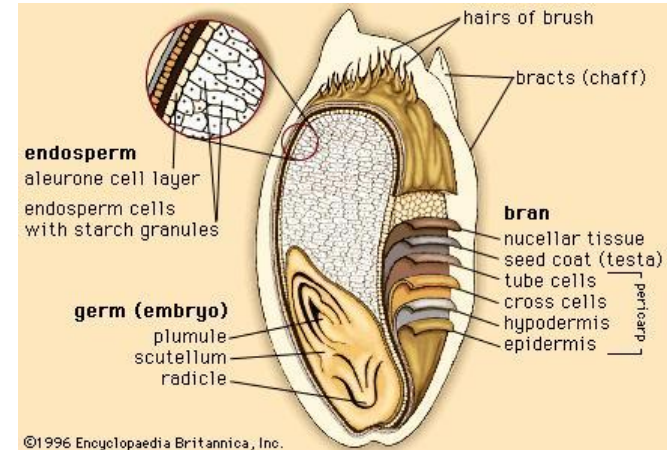
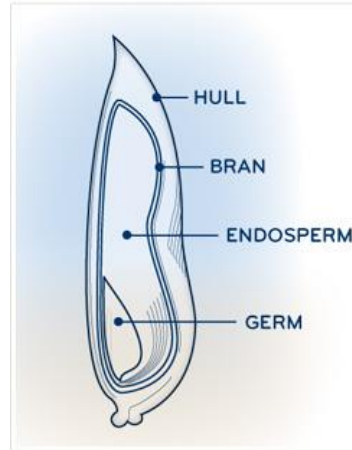


The difference between pot barley (left) and pearl barley (right) is subtle.

# **MILLING OF OATS**

✓ The oat, grain consists of

- (1) husk,
- (2) aleurone layer,
- (3) germ and
- (4) endosperm.



- ✓ The important oat products of commerce are **rolled oats and oat flakes**.
- ✓ Oats free from the husk are **called groats**.





- The steps involved in the milling are
- (1) cleaning,
- (2) drying or light roasting of oats to a moisture content of 6 per cent and
- (3) dehulling.

1). **Cleaning:** The initial step in oat milling process, as with other grain is cleaning of the grain to remove extraneous matter, such as other cereal grains, weed seeds, chaff, etc', and to separate the light oats.

2). **Drying:** The next step is to reduce the moisture content to about 6 per cent so as to facilitate the removal of the husk. The drying is carried out by a light roasting process which also helps to develop a desirable flavour in the groats.

3). **Dehulling:** The lightly roasted oats are gradgd and each lot is passed through hullers, similar to those used for hulling paddy. The husk is removed and the groats thus obtained are used for being processed into rolled oats, oat flakes, etc.

## Rotted oats

- ✓ The groats are steamed directly with live steam. This process partially cooks the oats and also inactivates the enzymes., lipase and lipoxidase present.
- ✓ This will help to prevent the development of rancidity and increase the shelf-life of the product.
- ✓ The next step is the **flaking process**.
- ✓ This is accomplished by feeding the steamed groats between two large steel rolls.
- ✓ The yield of rolled oats is usually **about 40-45 per cent**, as about 20 per cent of the hulls and 30-35 per cent of other products such as oat shorts, and oat middling and other cereal grains are removed during cleaning, milling and flaking processes.

# **MILLING OF RYE**

- ✓ Rye is cultivated extensively in Europe and used along with wheat flour in bread making.
- The rye grains are long and slender.



- ✓ **Milling:** Rye milling is an important industry in Europe and differs in many respects from normal wheat milling.
- ✓ The rye is cleaned and conditioned.
- ✓ It is passed through successive break rolls and the husk is aspirated.
- ✓ Finally the purified middlings are passed through reduction rolls.
- ✓ Rye flour thus obtained is dark in colour.

- ✓ Rye bread: Rye bread is not made generally with yeast; instead sour dough is used for fermentating the dough.
- ✓ Sour dough contains lactic acid bacteria.
- ✓ It is customary to mix wheat flour with rye flour to the extent of **20 to 30 per cent.**
- ✓ The rye breads are baked in the same way as wheat bread.

# **MILLING OF SORGHUM**



✓ Sorghum grains are processed by **dry milling**, **wet milling** and by **fermentation**.

- The products of milling are chiefly starch and feed products.
- In India however, very few processed products of sorghum are commercially produced.

### **Dry Milling:**

- Dry milling is used to obtain products low **in fiber, fat and ash**, and wet milling to make **starch and its derivatives**. The residue from wet milling is used as a feed.
- The dry milling process starts with the **cleaning** of grains. The cleaned grain is **conditioned**, by addition of water, to soften the endosperm and **milled** by the conventional roller mills, to separate the endosperm, germ and bran from each other.
- The endosperm is recovered in the form of grits, with the minimum production of flour.

- ✓ Yields of various fractions from the dry milling process are : grit , 76.7; bran, 1.2; germ,11; and fiber,10 percent.
- ✓ Bran and germ are further processed, as in the case of maize, by dry milling for the preparation of oils and feeds.

### **Wet milling:**

- ✓ Wet milling of sorghum is carried out by methods similar to that of **maize wet milling**.
- ✓ However, the milling of sorghum is more difficult than that of maize because of the **small size and spherical shape** of the sorghum kernel and the dense high protein peripheral endosperm layer.
- ✓ Manufacture of **starch** is the main purpose of wet milling.
- ✓ The sorghum malt is used in the preparation of infant foods and malt extracts produced from sorghum are employed in the pharmaceutical industry.



# **MILLING OF MILLETS**

- ✓ The name millet is applied to numerous small seeded grasses which originated in Asia or Africa.
- ✓ Apart from **maize and sorghum**, the major millet crops of India are **Pearl millet called bajra and finger millet known as ragi**.
- ✓ A number of other minor millets are grown and they are : the common millet or proso millet, foxtail millet and kodo millet.
- ✓ These millets along with maize and sorghum, are considered as coarse grains and constitute the food of the economically weaker sections of the population in India.

## Pearl millet (Bajra):

- ✓ Among millets, bajra is the predominant crop in India.
- ✓ About 85% of bajra produced in country is used as food.
- ✓ It constitutes the staple diet of nearly 10% of Indian population.
  
- ✓ It is consumed after dehusking and cooked in the same way as rice.
- ✓ More commonly it is ground into flour and made into chapattis.
- ✓ It is also made into thin porridge.
- ✓ Bajra grains, ground or softened by soaking in water, find use to a limited extent as animal feed.
- ✓ The processing of bajra and other millets for industrial purposes has not yet been developed.

## **Finger millet:**

- ✓ The finger millet or ragi is another important millet cultivated in India.
- ✓ Ragi is the principal food grain of the rural population in India, especially in the southern region.
- ✓ It is usually converted into flour and a variety of preparations like mudde, chapatti, dosa, porridge etc are prepared.
- ✓ The grain is also malted and the flour of the malted grain is used as a nourishing food for infants and invalids.
- ✓ The nutritive value of ragi is better than that of rice and other cereals.

# ASSIGNMENT

1. What is pearling in sorghum?
2. Write the various food products from barley, oat, rye, sorghum and millet processing.