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Programme : M.Sc., Biochemistry

Course Title; FOOD PROCESSING TECHNOLOGY

Course Code : BC001VAC

Unit – I

CEREALS

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INTRODUCTION

CEREALS

- **RICE**
- **WHEAT**
- **CORN**
- **BARLEY**
- **OATS**

RICE

- Rice, one of the world's most widely consumed staple foods, holds a significant place in global agriculture, cuisine, and culture. Originating in Asia thousands of years ago, rice has since spread across continents, becoming a dietary cornerstone for billions of people worldwide.

PROCESSING OF RICE

- **Harvesting:**

Rice is harvested when the grains have reached full maturity. It is typically cut and gathered in bundles.

- **Transportation to Mill:**

The harvested rice is transported from the fields to the rice mill for further processing.

- **Cleaning:**

Upon arrival at the mill, the rice undergoes cleaning to remove dirt, stones, and other impurities.

- **Hulling:**

The outer husk of the rice grain is removed in a process called hulling or dehusking. This step produces brown rice.

- **Milling:**

The brown rice then undergoes milling to remove the bran layers and germ, resulting in white rice.

- **Polishing:**

Optionally, the white rice may be polished further to improve its appearance by removing any remaining bran particles.

- **Grading and Sorting**

Rice is sorted and graded by size and quality using sieves and optical sorters. This ensures uniformity in the final product.

- **Packaging:**

The processed rice is packaged into bags or containers for distribution and sale.

WHEAT

- **Wheat** is a type of cereal grain that belongs to the *Triticum* genus and is one of the most widely cultivated and consumed crops globally. It is primarily grown for its edible seeds (often referred to as wheat grains), which are milled to produce flour used in a wide variety of food products, including bread, pasta, and baked goods. Wheat is an essential staple food, providing a significant source of carbohydrates, proteins, and other nutrients.

PROCESSING OF WHEAT

- **Receiving and Cleaning**: Raw wheat grains are received at the processing plant and undergo initial cleaning to remove impurities such as dirt, stones, and chaff.
- **Tempering:** The cleaned wheat grains are then conditioned with water to toughen the bran and mellow the endosperm, which aids in subsequent milling.

- **Milling:**

The tempered wheat grains are ground in a series of roller mills to separate the bran (outer layer), germ (embryo), and endosperm (starchy center).First Break: Wheat is passed through rollers that crack open the grains, separating the outer layers from the inner endosperm.

- **Second Break**:

Further milling separates finer bran particles and germ from the endosperm.

Reduction:

The endosperm is ground into flour through several reduction stages to produce different types of flour (e.g., whole wheat flour, white flour)

CORN

Corn, also known as **maize** in many parts of the world, is a cereal grain that originates from the Americas. It belongs to the species *Zea mays* and is a member of the grass family, Poaceae. Corn is a staple crop and one of the most widely grown grains globally, known for its high carbohydrate content and versatility.

PROCESSING OF CORN

- **Harvesting:**

Corn is harvested from the field when it reaches maturity. This usually occurs in late summer or early fall, depending on the variety and growing conditions.

- **Drying:**

After harvesting, corn is often dried to reduce its moisture content. This can be done using natural methods like air drying or mechanical methods like using a grain dryer. Proper drying helps prevent mold and spoilage.

- **Cleaning:**

The dried corn kernels are cleaned to remove any debris, dirt, or foreign materials. This can involve screening, air blowing, or other cleaning methods.

- **Milling:**

Corn can be milled in different ways depending on the intended end product:

- **Dry Milling:**

This process grinds the corn kernels into various flour or meal products. It also separates the kernels into their constituent parts: endosperm (starch), germ (oil), and bran (fiber). Products from dry milling include cornmeal, corn flour, and grits.

- **Wet Milling:**

This involves soaking the corn in water to soften it before milling. It separates the kernels into their individual components: starch, gluten, and fiber. This process is used to produce corn syrup, ethanol, and other products.

Processing of corn into Products

- **Corn Starch:**

  Extracted from the endosperm during wet milling, corn starch is used as a thickener in cooking and baking.

- **Corn Syrup:**

  Made from corn starch, corn syrup is used as a sweetener in many foods and beverages.

- **Corn Oil:**

  Extracted from the germ, corn oil is used for cooking and in various food products.

- **Cornmeal and Grits:**

  Produced from ground dried corn, these are used in baking and as side dishes.

- **Corn Flour:**

  Finely ground cornmeal, used in baking and cooking.

BARLEY

- **Barley** (*Hordeum vulgare*) is a cereal grain that belongs to the grass family *Poaceae*. It is one of the oldest cultivated crops and is grown for its edible seeds (barley grains). Barley is a versatile crop used in a wide range of products, including food, beverages, and animal feed.

PROCESSING OF BARLEY

- **Cleaning**

After harvesting, barley is cleaned to remove dirt, debris, and other foreign materials using sieves, air blowers, and vibrating screens. This ensures that only high-quality grains move forward in the process.

- **Malting (for Brewing and Distilling)**

Barley is soaked in water (steeping), allowed to germinate (sprouting), and then dried in a kiln (kilning). This process activates enzymes that convert starches into fermentable sugars, which are crucial for brewing beer and making whiskey.

- **Milling;** For flour or feed production, barley is ground into flour or crushed into smaller pieces. The husk can either be removed or included, depending on the intended use. The resulting product can be packaged for sale or further processing.
- **Pearling;** In some cases, barley is pearled to remove the outer husk, creating "pearl barley." This is used in soups, stews, and salads, providing a soft, digestible form of the grain.
- **Storage;** After processing, barley is often stored in cool, dry conditions to prevent spoilage. Proper storage ensures the quality of the grain is maintained until it is ready for further use.

OATS

- **Oats** (*Avena sativa*) are a type of cereal grain that belongs to the *Poaceae* (grass) family. They are primarily grown for their seeds, which are used in a wide range of food products, particularly in breakfast cereals like oatmeal and granola, as well as in baked goods.

PROCESSING OF OATS

- **Harvesting**

Oats are harvested when the grains are fully mature, typically when the plants turn yellow and the seeds harden. Modern combines are used to separate the grains from the rest of the plant.

- **Cleaning**

The harvested oats are cleaned to remove dirt, stones, debris, and damaged grains. This is done using air blowers, sieves, and vibrating screens to ensure high-quality oats are used in further processing.

- **Dehulling (Hulling)**

Oats have a tough outer husk that needs to be removed. This is done through dehulling, where the outer husk is mechanically separated from the inner, edible part of the grain known as the groat.

- **Processing into Forms**

The dehulled groats are then processed into different forms depending on the product.

Rolled oats: Steamed and flattened for oatmeal.

Steel-cut oats: Groats are chopped into pieces for a coarser texture.

Oat flour: Ground into flour for baking or cooking.

Instant oats: Pre-cooked, dried, and flattened for quick cooking.

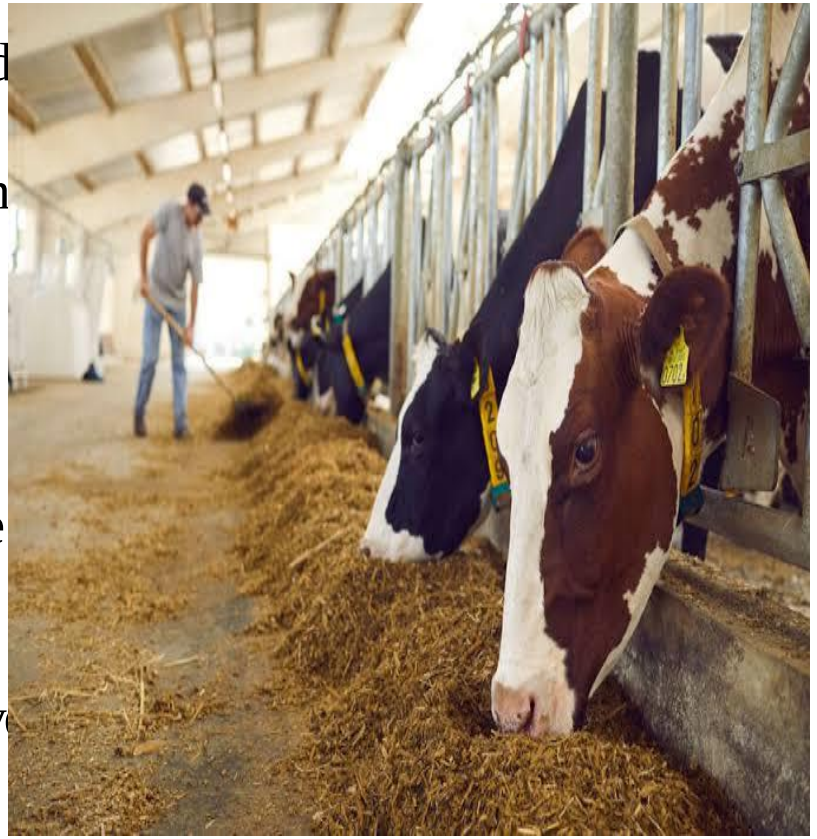
- **Packaging and Storage**

Once processed, oats are packaged for sale in various forms (e.g., rolled, steel-cut, or flour). They are stored in a cool, dry environment to maintain freshness and extend shelf life.

FEED FOR LIVESTOCK FROM WHEAT BRAN AND GERM

INTRODUCTION

- **Animal feed** is food given to domestic animals, especially livestock, in the course of animal husbandry.
- Animal wellbeing is highly dependent on feed that reflects a well balanced nutrition. Some modern agricultural practices, such as fattenin cows on grains or in feed lots, have detrimental effects on the environment and animals.
- For example, increased corn or other grain in feed for cows, makes their microbiomes more acidic weakening their immune systems and making cows a more likely vector for *E. coli*, while other feeding practices can improv animal impacts. For example, feeding cows certain kinds of seaweed, reduces their production of methane, reducing the greenhouse gases from meat production.



Wheat Bran Cattle Feed

- Wheat Bran Cattle Feed is a high-quality, nutritious feed that is made with all-natural ingredients. It is a great way to support your cattle's health and productivity. Wheat Bran Cattle Feed is also a safe and affordable choice for your livestock.
- Wheat Bran Cattle Feed is a good source of protein, fiber, and vitamins.
- Wheat Bran Cattle Feed can help to improve your cattle's coat, weight, and milk production.
- Wheat Bran Cattle Feed is easy to digest and can help to prevent digestive problems.
- Wheat Bran Cattle Feed is a safe and affordable choice for your livestock.

Wheat Bran for Cattle Feed

- Wheat bran is a high-quality feed for cattle that is rich in protein and fiber. It is a good source of energy and nutrients, and it helps to promote healthy digestion and coat condition. It can also help to build muscle mass in cattle.

Features:

- High in protein (14%)
- High in fiber (13%)
- Low in fat (2%)
- Moisture content of 13% max
- Made by Bharat Feeds & Extractions Limited, a trusted and reliable brand

Benefits:

- Promotes healthy digestion: Wheat bran is a good source of fiber, which helps to keep the digestive system healthy. This can help to reduce the risk of constipation and other digestive problems.
- Improves coat condition: Wheat bran is a good source of vitamins and minerals, which can help to improve the condition of the coat. This can make the coat look shinier and healthier.
- Helps build muscle mass: Wheat bran is a good source of protein, which is essential for building muscle mass. This can help to improve the overall health and condition of the cattle.

- **Usage:**
- Wheat bran can be fed to cattle as a meal or as a supplement to their regular diet. You can mix it with other feeds or feed on its own. The amount of wheat bran that should be fed to cattle will vary depending on the size and age of the animal. It is important to consult with a veterinarian to determine the correct amount of the product to feed to cattle.
- **Storage:**
- Wheat bran should be stored in a cool, dry place. It can be stored in bags or bins. It is important to keep wheat bran away from moisture and heat, as this can cause it to spoil.

CORN GERM MEAL

Description

Corn germ meal is the by product of oil extraction from corn germ obtained from corn processing.

It is a mid range protein and energy ingredient suitable for all classes of livestock.

Use and application

Corn germ meal is an excellent source of protein and fibre for cattle and poultry and provides a good balance of aminoacids and essential nutrients.

Corn germ meal use in companion animal feed is complementary to other ingredients in these diets.

Storage and handling

Corn germ meal is available as a free flowing meal. The product is light brown in color with a medium coarse meal texture. It can be handled in most bulk material handing system.

TYPICAL ANALYSIS

	DMB	As Fed
Dry Matter	100.00%	89.50%
Crude Protein	25.10%	22.30%
Crude Fat	2.36%	2.10%
ADF	41.50%	37.10%
NDF	55.30%	49.50%
Calcium	0.01%	0.01%
Phosphorus	0.48%	0.43%
Ash	2.60%	2.30%
TDN	75.20%	67.30%
$NE_{L\ (Rum)}$	0.78 Mcal/lb	0.70 Mcal/lb
$NE_{m\ (Rum)}$	0.82 Mcal/lb	0.73 Mcal/lb
$NE_{g\ (Rum)}$	0.51 Mcal/lb	0.46 Mcal/lb

* Listed data are average values only and not considered as guarantees, expressed, or implied, nor as a condition of sale. For guaranteed specifications refer to feed label.

REFERENCE

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THANK YOU