Cereals
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• Cereals are the staple food of many countries

• They are the grains of cultivated grasses which are cheap and easy to grow whatever the climate

Main cereals include:

• Wheat
• Rice

• Oats
• Maize

• Barley
• Rye
## Composition of Cereals

<table>
<thead>
<tr>
<th>Protein</th>
<th>Fat</th>
<th>Carbohydrate</th>
<th>Vitamins</th>
<th>Minerals</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>12%</td>
<td>2%</td>
<td>72%</td>
<td>1%</td>
<td>1%</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B &amp; E</td>
<td>Ca, Fe</td>
<td></td>
</tr>
</tbody>
</table>

Water: 12%
Wheat

Wheat is the most widely grown cereal in the world.

The wheat grain consists of three main parts:

- Endosperm 85%
- Bran 13%
- Germ 13%

Wheat Grain
Wheat

The wheat germ is also made up of:

- Beard
- Aleurone Layer
- Scutellum

Wheat Grain
## Structure of Wheat Grain

<table>
<thead>
<tr>
<th>Structure</th>
<th>Description</th>
<th>Nutrients Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bran</td>
<td>Tough outer layer of cellulose which are indigestible by humans</td>
<td>Fibre, B vitamins, calcium, non haem iron and phosphorus</td>
</tr>
<tr>
<td>Endosperm</td>
<td>Largest part of grain. Composed mainly of starch. Outer layer of endosperm is called the aleurone layer</td>
<td>Starch, protein gluten and some B vitamins. The aleurone layer is rich in protein.</td>
</tr>
<tr>
<td>Germ</td>
<td>Contains the nutrients needed by the plant to germinate and grow.</td>
<td>Rich in protein. Fat, some non haem iron, B vitamins and vitamin E.</td>
</tr>
</tbody>
</table>
Nutritive Value

• **Protein:** Gluten is the main protein. Cereals contain small amounts of LBV protein but can be deficient in some essential amino acids

• **Fat:** All fat is polyunsaturated and is present in the germ which contains essential fatty acids

• **Carbohydrate:** Most carbohydrates are in the form of starch (64%). The remainder is cellulose (8%), found in the bran which is removed during the production of white flour

• **Vitamins:** Cereals are an important source of B vitamins, especially B$_1$, B$_2$ and B$_5$. Processing removes these. Vitamin E is present in the germ

• **Minerals:** Minerals include calcium, non-haem iron and phosphorus

• **Water:** Low water content means it has good keeping qualities
Dietetic Value

• Cereals are an important energy food due to starch content

• When unprocessed, they are rich in fibre. This aids digestion by stimulating peristalsis which is essential for good health

• Wholegrain cereals contain B vitamins (energy release), calcium (healthy bones and teeth) and iron (blood)

• They are a source of essential fatty acids which do not contribute to cholesterol. The fat present is unsaturated

• Cereals are economical, versatile, nutritious and readily available
Dietetic Value

- Phytates present in wholegrain cereals inhibit calcium and iron absorption.
- When polished rice and maize are staple foods, deficiency diseases can result e.g. beri beri and pellagra.
- Highly processed cereals should be avoided due to loss of nutrients and the addition of sugar.
- Coeliacs must avoid wheat, oats, barley and rye. (Coeliacs cannot digest gluten.)
Buying and Storing Cereals

- Buy in a clean, hygienic, well ventilated shop
- Check the date stamp
- Packaging should be strong and clearly labelled
- Store in a cool, dry place
- When opened, store in an airtight container
- Use within the recommended time
- Be aware that wholegrain cereals have shorter shelf life. They deteriorate faster due to the fat content in the germ
Effects of Heat on Cereals

• Protein coagulates and sets

• Loss of B vitamins

• Fibre softens and absorbs moisture

• In moist heat, starch gains swell, burst and absorb liquid e.g. gelatinisation

• In dry heat, starch grains swell burst and absorb fats e.g. pastry, popcorn
Effects of Heat on Cereals

- Starch when heated becomes more digestible
- Surface starch when heated changes to dextrins (short starch chains) which browns the food e.g. toast. Process is known as dextrinisation
- Surface sugars caramelise
Milling

- Milling is the term used to describe the processing of wheat to produce flour

- Extraction rate refers to the percentage of the grain used in producing flour which in turn affects the nutritive value of the flour
Effects of Processing on Cereals

• Cereals are often fortified with vitamins and minerals to replace those lost in processing

• Texture changes. The more refined products have a softer texture whilst unrefined products have a harder texture

• Bleaching agents are added to whiten flour

• Improvers are added to improve the quality of the gluten

• Removal of germ improves the keeping qualities

• Wholegrain cereals/flour contain more protein and fibre as the bran is not removed
## Types Of Flour

<table>
<thead>
<tr>
<th>Type of Flour</th>
<th>Extraction Rate</th>
<th>Description</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholemeal Flour</td>
<td>100%</td>
<td>None of the grain removed</td>
<td>Bread</td>
</tr>
<tr>
<td>Wholegrain Flour</td>
<td></td>
<td></td>
<td>Scones</td>
</tr>
<tr>
<td>Stoneground</td>
<td>100%</td>
<td>Rolled by stone rollers instead of metal rollers</td>
<td>Bread</td>
</tr>
<tr>
<td></td>
<td></td>
<td>None of the grain removed</td>
<td>Scones</td>
</tr>
<tr>
<td>Brown Flour</td>
<td>83%</td>
<td>Some of the bran removed</td>
<td>Bread</td>
</tr>
<tr>
<td>Bran Flour</td>
<td></td>
<td></td>
<td>Scones</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pastry</td>
</tr>
<tr>
<td>Type of Flour</td>
<td>Extraction Rate</td>
<td>Description</td>
<td>Use</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Plain Flour/ White Flour/ Cream Flour</td>
<td>75%</td>
<td>Contains endosperm only, Bran and Germ removed, Fortified with vitamins and minerals</td>
<td>Cakes, Bread, Sauces, Pastry</td>
</tr>
<tr>
<td>Self Raising Flour</td>
<td>75%</td>
<td>White flour with raising agent added</td>
<td>Cakes, Desserts</td>
</tr>
<tr>
<td>Strong Flour</td>
<td>75%</td>
<td>High gluten content</td>
<td>Yeast Baking</td>
</tr>
<tr>
<td>Gluten Free Flour</td>
<td></td>
<td>Gluten removed</td>
<td>Coeliac Cookery</td>
</tr>
<tr>
<td>High Ratio Flour</td>
<td>&lt;50%</td>
<td>Low gluten content, Soft, finely milled</td>
<td>Confectioneries</td>
</tr>
</tbody>
</table>
Cereal Products – Breakfast Cereals

- Wide range available
- Often fortified with vitamins and minerals
- Other ingredients added such as fruit, nuts, honey, chocolate etc
- Some high fibre content, others high in sugar and salt
Cereal Products - Pasta

- Made from durum wheat (high gluten content)
- Durum wheat milled into semolina
- Semolina mixed with eggs, oil, salt and water
- In some cases tomato puree or spinach are added
- Dough moulded into shape
- Sold fresh or dried
Cereal Products - Rice

• Contains less protein, fat and minerals than other cereals

• Huge variety available
  
  o Short grain rice – used in rice puddings

  o Medium grain rice – used in risotto and salads

  o Long grain rice – used in savoury dishes

• Basmati rice – best type for flavour and texture

• Brown rice – only some bran removed. Richer source of fibre
Cereal Products - Oats

• High in protein, fat and minerals

• Oat flour can be used in bread making

• Used to make porridge, flapjacks and muesli
Cereal Products - Barley

- Used in the production of malt
- Used to make pearl barley and barley water
Cereal Products - Maize

• Used to produce cornflakes, corn on the cob, sweet corn and pop corn

• Maize growing in Ireland for agricultural purposes has increased