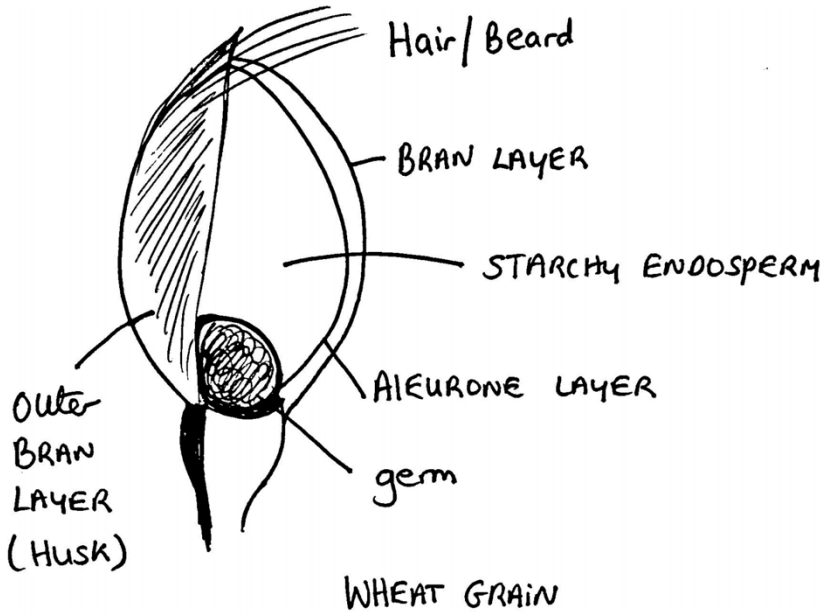
FOOD COMMODITIES (CEREALS) - 1.3.2

A: STRUCTURE OF A WHEAT GRAIN



1) HUSK – BRAN LAYER (13%)

- Mainly Cellulose.
- High in Niacin.
- Calcium, Iron + Phosphorous present.

2) ENDOSPERM (85%)

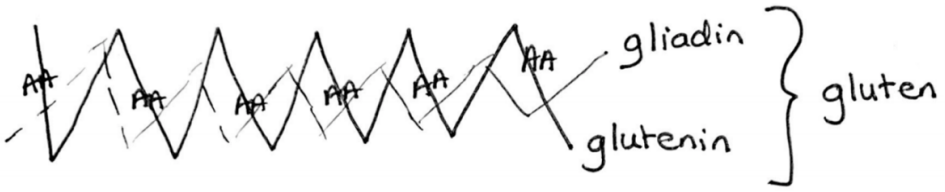
- High in Starch.
- Gluten present.
- Vitamin B.

3) GERM (2%)

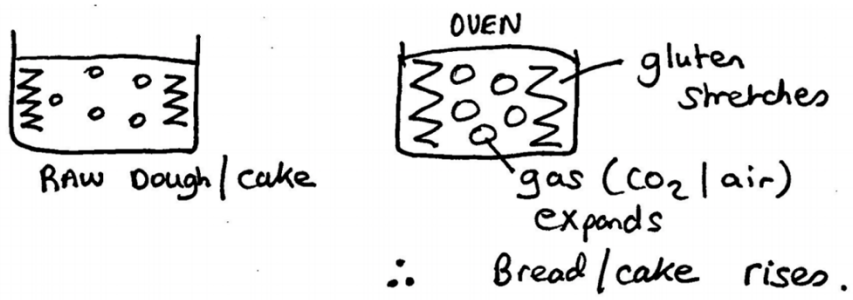
- Only part of grain with lipid, Vit E present.

B: GLUTEN/ROLE IN BAKING

- Gluten is a fibrous protein in wheat, oats, rye.
- It has a 3D Shape/Zig-Zag structure.



- It is made up of two polypeptide chains **glutenin** and **gliadin**.
- When moistened gluten forms a sticky elastic dough which stretches as gases (air + CO_2) expand in the oven during baking.



- **Strong Flour** (BAKER'S FLOUR) contains 12% gluten (used in yeast dough)

C: EXTRACTION RATE

Definition.

- % of grain that remains in flour after processing.
- **Wholemeal Flour** ER 100% (ie) : the whole grain is present in the flour.
- **White Flour** ER 73% (ie) : most of the endosperm is used in this flour.

D: INFLUENCE OF CLIMATE ON GLUTEN CONTENT OF WHEAT

- The gluten content of flour is greatly influenced by the climate that the wheat is grown in.
- **Spring Wheat** : In Canada/Russia, wheat is set in Spring and harvested in Autumn, quick growth therefore wheat has a higher gluten percentage (12%)
  - Used for strong flour.
- **Winter Wheat** : In Ireland, wheat grows over the winter months, grows slowly therefore wheat has a lower gluten percentage (9%)
  - Used for plain household flour.

REVISE : Coeliac Disease ("Special Diets"), Nutritive/Dietetic Value (Nutritive Value of Foods sheet)

DIETETIC VALUE : Energy (Starch), Coeliacs (avoid Wheat Flour), Cellulose (Brown Flour) – Peristalsis.

E: EFFECTS OF COOKING/HEAT

Know 4

Link with "Properties of Carbohydrates"

- **Dextrinisation** : browning of bread dough.
- **Moist Heat** : gelatinisation (Roux Sauce)
- Starch becomes more digestible.
- B Vitamins are destroyed (especially Thiamin B1)
- NB - **Dry Heat** : starch grains swell and burst absorbing butter as it melts (pastry)

F : CLASSIFY FLOUR (IE) TYPES OF FLOUR

Know 5

1) WHITE FLOUR

- 73% ER.
- Fortified with Calcium.
- Mainly Endosperm.
- No fat present therefore longer shelf life.
- High in starch, low in fibre.
- APPLICATION : Roux Sauce, Sponge Cake, Batters.

2) WHOLEMEAL FLOUR

- 100% ER.
- Whole grain, crushed.
- High in fibre, high in Vitamin B.
- **APPLICATION** : Wholemeal Bread, Wholemeal Scones.

3) STRONG FLOUR

- High gluten content (12%)
- Elastic dough.
- **APPLICATION** : Yeast Bread, Pizza.

4) GLUTEN FREE FLOUR

- Suitable for Coeliacs.
  - (a) Starch is washed out.
  - (b) Liquid is dried.
  - (c) Soya flour often added.
- **APPLICATION** : Gluten Free Bread, Pastry.

5) SELF RAISING FLOUR

NB : MILLING OF WHEAT – STAGES OF PRODUCTION

(FOOD THAT HAS BEEN EXTENSIVELY PROCESSED)

Wheat → Flour / 2020 Q2. B (b)

1) CLEANING THE GRAIN

- The wheat is harvested, wheat grain is cleaned by removing any dirt or stones present, the grain is the washed and dried.

2) CONDITIONING

- This is the addition of fixed amount of water to grain which allows the subsequent milling process to take place more effectively as this process stiffens the ~~brain~~ bran and softens the endosperm.

3) GRIST

- Various types of wheat are blended to get the correct mixture/blend e.g. if the flour miller is producing strong flour, the grist or blend will mainly consist of spring wheat which has 12% gluten content.

4) BREAK ROLLING

- Wheat grains are passed through metal rollers, the grains are split open (wholemeal flour at this stage)

endosperm → deep yellow/ochre colour.

5) SIEVING

- The crushed wheat is sieved, the bran is separated first, followed by the germ. The crushed endosperm (semolina) is then sieved numerous times until it has "smooth/silky" texture.

2020 12mk b@2mk

6) AIR CLASSIFYING

- Air is blown through flour to remove any lumps and add lightness to the flour.

7) ADDITIVES

- White flour is bleached with E928 (Benzoyl Peroxide), Calcium is added (Calcium Carbonate), Vit B1, Niacin, Iron are added.

Thiamin.

PACKAGING OF FLOUR

- The flour is weighed (1kg, 2kg)
- The flour is packed into paper bags and sealed.

LABELLING

- Description of product e.g. plain household flour, self-raising flour, strong flour, etc.
- Brand name e.g. Odlum's flour
- Durability e.g. ~~use~~ by June 2025.

Best before

NUTRITIVE VALUE OF WHEAT

PROTEIN

- 12% of the wheat grain.
- It is Low Biological Protein (LBV %)
- Cereals are incomplete protein foods which means they are lacking in one or more essential amino acids.
- The main protein in flour is the fibrous protein gluten. Wheat is low in Lycine.

LIPIDS

- The only part of the wheat grain that contains lipids is the wheat germ, mainly unsaturated fatty acids.

CARBOHYDRATE

- 74% (Starch 65%, Fibre 9%)
- Unprocessed cereals have a higher amount of fibre than processed cereals.

MINERALS

- Wheat contains Calcium, Phosphorous and Iron.

VITAMINS

- Cereals are an excellent source of B Vitamins (eg) : Vitamin B1 (Thiamin), B2 (Riboflavin) and Niacin.
- Wheatgerm contains Vitamin E (fat soluble vitamin)
- Cereals lack Vitamin C.

DIETETIC VALUE OF CEREALS

COELIAC DISEASE

- Many Irish people have an intolerance to the protein in wheat (gluten) also found to a lesser extend in oats, rye and barley. Instead of these grains they should eat rice, gluten free flour, cakes etc. to avoid damage to the villi of the small intestine.

ENERGY

- Cereals are an excellent source of starch which provides people with a source of energy, whole cereals contain B Vitamins which act as co-enzymes to help release the energy from carbohydrates (starch) more efficiently.

PERISTALSIS

- Whole cereals have an outer bran layer which is a NSP (Non Starch Polysaccharide). This is a source of fibre that can stimulate peristalsis and help prevent constipation.

LACK OF VITAMIN C

- Serve cereals with foods that are rich in Vitamin C to compensate for the lack of Vitamin C (eg) : Savoury rice (boiled rice, peas, sweetcorn) **or** serve a glass of pomegranate juice (orange juice with breakfast cereal.

AVOID TOO MANY CEREALS

- Avoid too many cereals in the diet as they are a source of starch. Excess starch can be converted to adipose tissue and a person may gain weight.

OTHER CEREALS

BARLEY

- Used in the production of alcohol and vinegar.
- Pearl Barley (bran & germ removed) is used to thicken soups.
- Grown in Ireland.

MAIZE

- 100% starch.
- Corn on the cob.
- Cornflakes.

- Popcorn.
- Cornflour.
- Corn Oil (Mazola)

RYE

- Grown in North East Europe / harsh weather.
- Rye bread.
- Crispbreads (Ryvita)
- Grown in poor soil.

OATS

- Very nourishing.
- Higher protein/mineral content than wheat.
- Not used in breadmaking.
- Rolled oats used for porridge, biscuits (flapjacks, Hob Nobs)

BROWN RICE

- Outer bran layer remains.
- Takes longer to cook.
- High in fibre and iron.

RICE

1) WHITE RICE

- Short grain, plump, tender and sticky when cooked.
- Used in sweet dishes (eg) : rice pudding.

2) LONG GRAIN RICE

- Light, fluffy rice when cooked.
- Used in savoury dishes.

3) BASMATI RICE

- Indian rice, excellent flavour and texture.
- Used in savoury dishes.
- Considered to be the best rice.
- It must be rinsed before use to stop it sticking during cooking.

4) EASI-COOK RICE

- Steam treated.
- Cooks quickly.
- 'Boil in the bag'

"Ben's" Rice → cooks in 2 mins

5) INSTANT RICE

- Long grain rice that has been cooked and dehydrated.
- Cooks very quickly when reconstituted.

COOKING RICE

- Cook in boiling salted water.
- 50g portion per person.
- Stir rice while cooking to stop it sticking to the base of the saucepan.
- Simmer white rice (12 minutes)
- Simmer brown rice (30-40 minutes)
- Cook 'al dente'!
- Cook just before storing.

STORAGE OF CEREALS

- Cereals are stored easily as they have a low moisture content, therefore they do not attract mould growth.
- Wholemeal cereals have a shorter shelf life as the germ is present.
- Store cereals in a cool, dry, well-ventilated area.

COUSCOUS **(112KCAL PER 100G)**

- Coarsely ground wheat (semolina) is moistened and tossed with fine wheat flour until it forms little round balls.
- It is one of the staple foods of the Maghrib (Western North Africa)
- Just pour boiling water or stock over couscous, let it sit in a bowl (cling film)

QUINOA

- Is a grain like crop derived from South America.
- It is cultivated as a food source for its edible starchy seeds (strictly speaking, it is a seed but commonly referred to as a grain)
- Quinoa has all essential amino acids so perfect for vegetarians but particularly vegans (complete protein food)
- Gluten free.
- Cholesterol free.
- Almost always organic.
- It is believed to have been a staple food for thousands of years in the Andes region of South America, therefore it is an ancient grain (ie) : it is cultivated now the same way it was millennia ago.
- Takes 10 to 15 minutes to cook.

PASTA

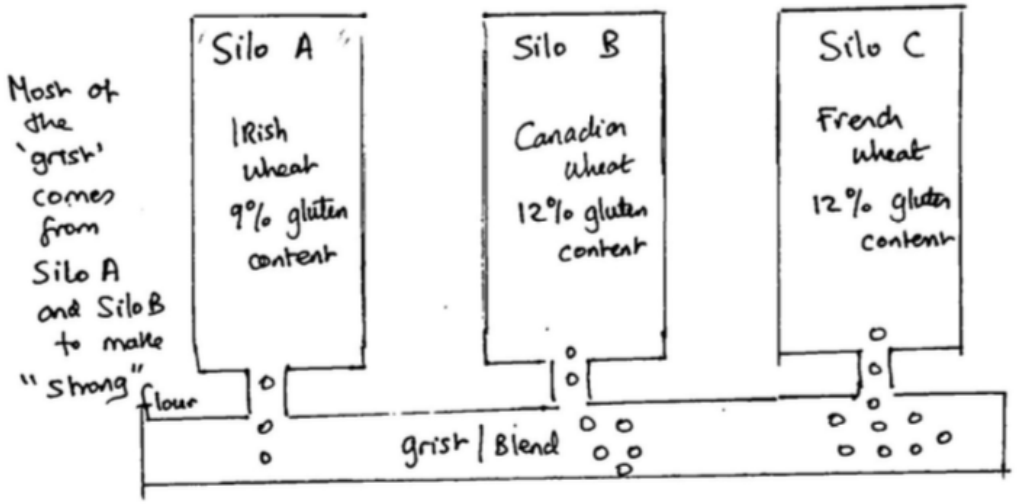
- Italy and China use it a lot.
- It is made from durum wheat.
- Coarse pieces of endosperm (ie) : semolina from durum wheat are blended with water, eggs, salt and good quality vegetable oil.
- The pasta is rolled and shaped.
- Commercial pasta is dried.
- Examples of pasta shapes include :
    - Shells.
    - Spaghetti.
    - Lasagna.
    - Macaroni.
    - Cannelloni.
    - Tagliatelle.
    - Ravioli.

COOKING PASTA

- Cook in boiling salted water.
- Add a little vegetable oil to the water to stop pasta sticking together.
- 50-75g pasta per person.
- Cook ‘al dente’.
- Fresh pasta cooks in approximately 3 minutes.
- Dried pasta cooks in approximately 12 minutes.
- When cooked, drain and serve immediately.
- If using pasta for cold salads, always rinse out cooked pasta in cold water to stop it from sticking.

grist.

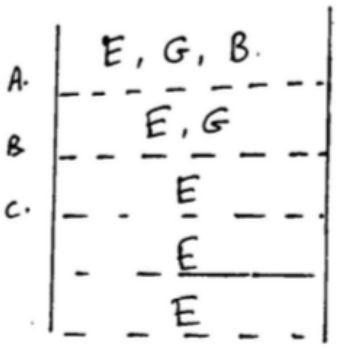
* The 'grist' is the special combination of wheat grains ie. the 'blend' of grains needed to make a specific type of flour.



Sieving.

After the wheat is crushed open by metal rollers, it is sieved, separating each of the key components of the grain

E = Endosperm
B = Bran
G = Germ



A. Bran is separated
B. Wheat germ is separate
C. Endosperm is sieved numerous times

* E928 – Benzoyl Peroxide
(Bleaching agent used across Europe to bleach white flour)