10 Cereals, Pulses and Oilseeds

Contents at a glance

Cereals

Cereals are a rich source of starch and are obtained mainly from seeds of grass family. Cereals are classified into two groups namely Major (fine) and Minor (coarse) cereals (Table 10.1).

Table 10.1 Classification of Cereals

Major Cereals		Minor Cereals	
English name	**Common name**	**English name**	**Common name**
Wheat	Gahu	Pearl Millet	Bajra
Rice	Tandul, Chawal	Sorghum	Jawar
Maize	Maka	Finger Millets	Ragi
		Barley	Jav

Note : Coarse cereals are also known as millets.

Cereals are major staple food in Indian diet. These are relatively inexpensive and are cheapest source of energy. Cereals especially millets are easy to grow and have a high keeping quality and satiety values. Cereals are mainly used as flours and a wide variety of cereals are processed into breakfast foods and ready to eat snacks.

Do You Know ?

The word cereal is derived from the Greek Word "Ceres" which means goddess of Agriculture.

CERES

- Roman name : Ceres
- Greek name : Demeter
- Domain : Goddess of grain, fertility
- Symbols : Torch, corn, wheat

Fig. 10.1 Greek Goddess of Agriculture

10.1 Composition and nutritional values of cereals:

Carbohydrate: Cereals contains 65 to 75% of carbohydrate, therefore, it is an important source of energy. 100 g of cereals approximately provide 350 calories energy. This energy is mainly supplied from starch. Carbohydrates are present in cereals in the form of crude fibre and soluble carbohydrates (Sugar).

Protein: Cereals provide 6 to 12% proteins. Oats contains 24% proteins. Since cereal is a staple diet in India, it contributes substantial amount of proteins in the diet.

Fat: Fat content of cereals is quite low (1 to 5%)

Minerals: Cereals contains 2% minerals. The important minerals present are iron, phosphorous and calcium.

Vitamins: Whole grains provide B-Complex vitamins especially thiamine, riboflavin, and Niacin.

Water: Cereal grains are mature seeds, which are dehydrated, therefore have a low moisture content of 10 – 12% , hence have a longer shelf life.

Table 10.2 Nutritive values of cereals and cereals products

Name	Energy KJ	Moisture %	Carbohydrate (g)	Protein g	Fat (g)	Fibre (g)
Rice raw milled	1491	9.93	78.24	7.94	0.52	2.81
Rice Parboiled milled	1471	10.09	77.16	7.81	0.55	3.74
Rice Flakes	1480	10.36	76.7	7.44	1.14	3.46
Rice Puffed	1514	9.40	77.68	7.47	1.62	2.56
Wheat, whole	1347	10.58	64.72	10.59	1.47	11.23
Wheat flour Atta	1340	11.10	64.17	10.57	1.53	11.36
Wheat flour (Refined)	1472	11.34	74.27	10.36	0.76	2.76
Jawar	1398	9.01	67.68	9.97	1.73	10.22
Bajra	1456	8.97	61.78	10.96	5.43	11.49
Ragi	1342	10.89	66.82	7.16	1.92	11.18
Maize, dry	1398	9.26	64.77	8.80	3.77	12.24

Source: Indian Food Composition Tables, National Institute of Nutrition (ICMR) Hyderabad

10.2 Value added products from cereals:

In our diet, cereal grains may be added in the whole form in certain preparations like *pulao*. The grains may be processed to prepare various cereal products like wheat flour, puffed rice, cornflakes, noodles and others, which give variety to our diets. The various cereal products are as follows :

Wheat :

Wheat products: Wheat is one of the most commonly cultivated cereals in the world. We use most of the wheat in the form of flour to make *chapatti, puri and paratha*. Wheat is process into various products by the process of milling.

Do You Know ?

The nutritive value of the product decreases as the extent of milling increases.

Whole Wheat: Whole grains are either soaked or germinated and added to preparations such as nutri-bhel, porridge and salads. However, the use is very limited. Nowadays whole puffed wheat is used in *chivda* and other such products.

Broken Wheat (Dalia): Whole wheat undergoes milling to get dalia. This is generally used in porridge and *khichadi*.

Semolina (Rawa): Coarse rawa and fine rawa are used in various preparations like *sheera*, *upama* and *laddu*.

Whole wheat flour (Atta): This is the most widely used wheat product to prepare *chapatti, phulka, puri and paratha*.

Refined Wheat Flour (Maida): This is white in colour and has a bland flavor. Maida is mainly used in fancy preparation such as bread, cake, biscuits, *shankarpali*, *bhatura*, covering of *samosa* and *karanji*.

Pasta Products: Pasta is a universally enjoyed food all over the world. Hard variety of wheat is used to prepare these products, which include macaroni, spaghetti, noodles and other similar products.

The main steps of pasta production are:

i. **Selection of raw material:** It is usually made from Durum wheat or flour of other grains and cereals.

ii. **Dough Mixing**: Flour is mixed with water. It is important that water is evenly distributed into the dough, to be well absorbed by starch granules and allow gluten net formation, which will give structure of pasta. During dough mixing, following points should be kept in mind:

   a) Amount of water

   b) Temperature of water

iii. **Dough Extrusion:** The dough is transferred into a cylinder, the lower end of which is fitted with special disc with different shaped openings like round, star, shell, spiral and bow. These give a desirable size and shape to the products. The dough is forced through the openings by applying high pressure, so that the product obtained is in various shapes according to the disc used. Cutting blades cut the different shaped strands to desired length.

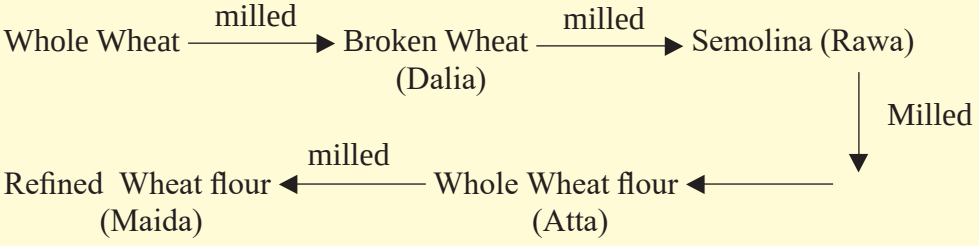


Fig. 10.2 : Wheat and its products formed during milling

iv. **Drying:** It is a crucial part of the process for production of high quality pasta products.

v. **Packaging:** After drying, pasta is cooled, cut and packed in sutaible packaging material.

Fig. 10.3a : Pasta making machine (Extrusion of Pasta)

Fig. 13.3 b Steps in pasta production

Do You Know ?

Pasta is a staple Italian food.

According to the length and shape pasta products are named as follows:

i. Macaroni: Usually in shell and tube form.

ii. Lasagna: Flat strips, about 2 - 3 inch wide.

iii. Spaghetti: Thin round strands, tube or rod shaped

iv. Fettucine: Flat strips, about 1/4 inch wide.

iv. Vermicelli: Traditional Indian product (Thin, round and string type). Made in same way as pasta. It may be hand made or machine made. It is used for making *kheer, sheera* and *upma*.

Spaghetti Lasagna Macaroni Fettuccine

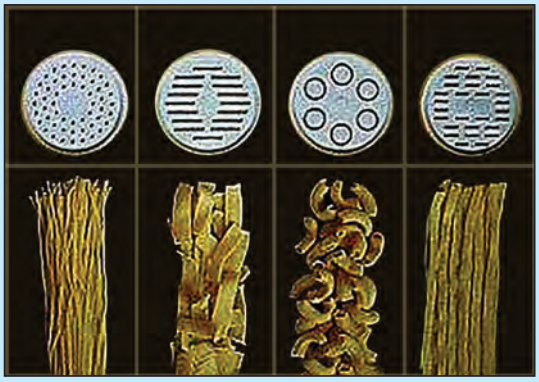


Fig. 10.4 : Pasta products

Lets Discuss: What is a Die in Pasta production?

Die is a mould or shape through which pasta dough is passed and gets converted into the desired shape of die.

Fig. 10.5 Types of die (mould or shape)

Rice :

Rice is the second most common cereal consumed in India. Many varieties of rice are produced throughout the world. In broad terms, they are classified into fine, medium and coarse.

Rice is marketed in different forms like brown rice, unpolished rice, polished rice, parboiled rice, flaked rice and puffed rice. Rice has to undergo certain processing like 'Milling' to obtain these different forms.

Rice Products:

Brown Rice: Brown rice are fed into stone or rubber disc to remove the husk. This rice is brown in colour, has high fibre content, therefore taking a longer time to cook. Shelf life of brown rice is low.

Unpolished Rice: Rice is milled to certain extent, however polishing is not done. It is whitish but has a dull appearance. These grains are prone to insect infestation.

Polished Rice: During milling, grains are passed through a brush machine and polished. They are later coated with sugar and talc, making them white and bright. Polished rice is most commonly used rice because of its appearance and typical flavour according to its variety e.g basmati rice.

Parboiled rice: Paddy (rice with its outer bran) is soaked in water for a few hours. Then it is steamed for a few minutes and dried. Parboiled rice has a better nutritive value compared to normal rice. Its cooking time is less as it is partially boiled and starch is partially gelatinized. It has a typical flavour and is suitable for fermented products like idli, dosa etc.

Puffed Rice: Dry paddy is soaked in hot water for 2-3 minutes. The water is drained off and grains are roasted. Due to heat, water is converted to steam resulting in puffing of the grain. Puffed rice is very light and easy to digest. It can be eaten without any cooking as in bhel or is added to certain preparations like *chivda* and puffed rice *laddu*.

Flaked Rice: Paddy is soaked in water for 2-3 days, followed by boiling and draining the water. The grains are heated and passed through rollers to flatten them. Flaked rice is rich in B-Complex vitamin and iron. It requires minimal or no cooking, and is light and easy to digest.

Instant cereal mixes

Some cereals and millets are pre-gelatinised and dehydrated. Other ingredients like vegetables, spices, preservatives, enzymes, acids and leavening, colouring and flavouring agents are added to prepare instant mixes e.g. instant pulao mix, pudding mix, idli mix, upma mix and many others. The major advantage is that the cooking time is very less as compared to normal cooking. However they are more expensive.

Variety of instant breakfast cereals are nowadays available in the market. Some of these cereal products like oat flakes are ready to cook breakfast cereals which require less cooking time. Other cereal products like cornflakes, wheat flakes are ready to eat breakfast cereals, which do not require cooking. In these breakfast cereals, other ingredients like sugar, honey, dry fruits, chocolate, fruit puree may be added to bring variety and make it more nutritious.

Fig. 10.6 a. Masala oats

Fig. 10.6 b Instant Cereal Mix

10.3 Principles involved in cereals cookery:

The major nutrient present in cereals is starch hence cereal cookery is mainly starch cookery. The principles involved in cereal cookery are as follows :

(a) Effect of dry heat on starch- Dextrinization :

Dextrinization: We are all familiar with the characteristic aroma and change in colour of rawa when it is roasted for preparation of *sheera* or *upma*. These changes are due to the breakdown of starch in rawa, into another polysaccharide called Dextrin.

Definition: Dextrinisation is a process, in which on application of dry heat, some starch granules break down into dextrin, a brown colour, a typical flavor and a slightly sweet taste develops e. g. *chapati*, toast, *sheera, upma*

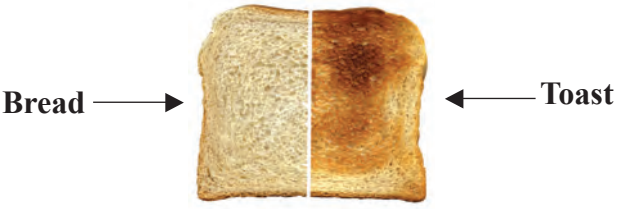


Fig. 10.7 Dextrinisation in toasting of bread

(b) Effect of moist heat on starch- Gelatinization :

Gelatinization: When water is added to rice, rice flour, corn flour and cooked to prepare dishes like boiled rice, steamed modak and custard, thickening takes place. This thickening is due to starch present in these foods.

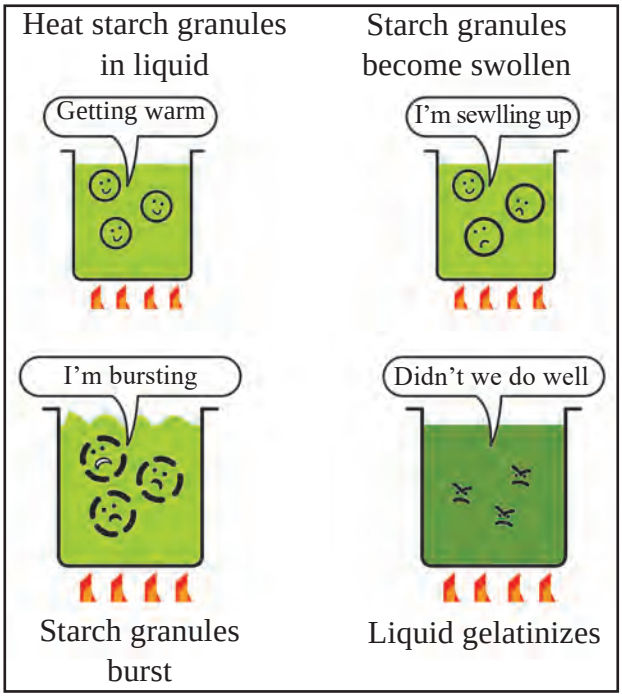


Fig. 10.8 Gelatinization process

Definition: Gelatinization is a process, by which, starch granules, when heated in water, absorb water and swell up making the solution thick and translucent.

(c) Identity of grain : In many cereal preparations like *pulao, biryani, upma, sheera,* the palatability is more if the cereal grains or particles do not stick to one another and remain seperate. This is called maintaining of identity of grain.

(d) Gluten formation: Wheat protein has two important constituents namely **glutenin** and **gliadin.** When water is added to wheat flour, kneaded and manipulated, Glutenin and Gliadin form a three dimensional network called the **gluten network.**

This mesh like network holds starch granules, air bubbles and water. A properly developed gluten in a dough makes the dough elastic and springy and easy to handle. The dough is able to retain gases and expand when heat is applied. Chapatis prepared from dough where gluten is well formed puffs up easily and remain soft. Gluten formation is desired in products such as *chapatis* and bread and is minimized in *puris, karanji* etc.

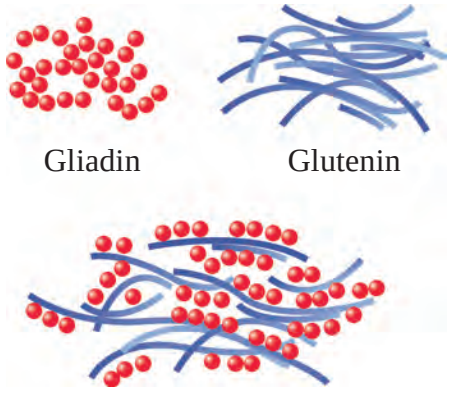


Fig. 10.9 Gluten formation

Can you tell?

Why chapatis swell and puff up on heating?

(e) Fermentation: Fermentation refers to breakdown of carbohydrates, under aerobic and anaerobic conditions. Some common fermented products made from cereals are *idli, dosa dhokla* and bread.

Activity:

Aim: Preparation of Dosa batter.

Materials needed: 1cup-black gram dal, 2 cups- rice, 4-5 fenugreek seeds.

Method:

1. Wash and soak the dal and rice separately for 6-8 hours or overnight.
2. Add fenugreek seeds to rice
3. Now grind the rice and dal and mix them together.
4. Keep them for 6-16 hours to ferment at a tempearture of about 25 - 30^0 C

Observations :

The batter becomes light and fluffy and a sour flavor and taste develops.

Conclusion: These changes are due to fermentation. The batter is ready to use.

Fig. 10.10 Steps of Fermentation

Fermentation results in the following Physical and chemical changes in the batter:

- Multiplication of micro-organisms
- Increase in acidity
- Development of sour flavour and taste
- Production of carbon-dioxide gas
- Increase in volume of batter

Uses:

Process of fermentation is used to prepare some baked products like bread, pizza base, buns and doughnuts. This process is also used to prepare *bhatura, idli, dosa, jalebi* and other such products

Advantages:

1. It improves the texture and flavour of the products.
2. Increases vitamin C and vitamin B complex
3. Easy to digest.

Pulses :

Pulses are edible fruits or seeds of leguminous plants. Pulses are the cheapest and rich source of protein, which can be considered as a lifeline for the vast vegetarian population of India. Apart from being the good source of protein, pulses also contain substantial quantity of minerals, vitamins, fibre etc. Amino acid composition of pulses is complementary to that of cereals. Mixed diet of cereals and pulses, which form staple balanced diet to majority of Indian population. It gives superior biological value than either taken separately.

Fig. 10.11 Name of the Pulses (English Name and Common Name)

India is the largest producer of pulses in the world. The common pulses grown in country are chickpea or bengal gram, pigeon pea or red gram, black gram, green gram, lentil, moth bean, horse gram, kidney beans and lathyrus, etc.

10.4 Composition and nutritional values of pulses:

The composition of pulses depends on the species. Generally protien content of the pulses are almost high as compared to cereals.

Protein: Usually pulses contains about 20% of the dry weight of the seeds. Some legumes contain upto the 40% of the protien e.g. soybean.

Carbohydrates: Food pulses contain about 55-60% of total carbohydrates including starch, soluble sugar and fibre etc.

Lipids: Generally pulses contain about 1.5% of lipids except groundnut and soybean etc.

Minerals: Pulses are important source of calcium, phosphorous, zinc, iron and potassium.

Vitamins: Pulses are fairly rich in niacin, thiamine, folic acid, pantothenic acid and vitamin C (germinated). They are poor in riboflavin and caroten (Provitamin-A), and dry legumes are almost devoid of ascorbic acid.

10.5 Processing of legumes and pulses:

a. **Decortication –** The removal of seed coat is known as decortications. A number of methods are available for decortications. A simple method is to soak the seeds for short time, the husk takes up more water than the seeds and may be easily separated by rubbing while still moist. The soaked grains may be dried and the husk removed by pounding and winnowing. Roasting is also another method of separating husk from seed.

Advantages:

1. Increases digestibility.
2. Helps in removing anti-nutritional factors.
3. Improves appearance, texture, cooking quality and palatability.
4. Reduces cooking time.

Red Gram Dal

Bengal Gram Dal

Fig. 10.12 Types of dal

b. **Soaking -** Soaking in water is the first step in most methods of preparing pulses for consumption. The pulses absorb water and increase in size during cooking. Some water soluble nutrients will leach out into the water. This water can be used in cooking to minimize these losses.

Advantages:

Soaking makes pulse tender due to water absorption. It reduces cooking time.

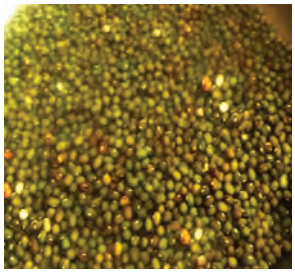


Fig. 10.13 Soaking of pulses

c. **Germination –** Whole legumes are soaked in water for about 6-8 hours. The excess water is drained and grains are wrapped in a wet muslin cloth or placed in a basket and covered and allowed to germinate for 12 hours or more.

Table 10.3 Nutritive value of Pulses (per 100 gm)

Sr.No	Foods	Protein (g)	Fat (g)	Carbohydrates (g)	Energy (Kcal)	Calcium (mg)	Phosphorus (mg)	Iron (mg)
1	Bengal Gram (Whole) Harbara	17.1	5.3	60.9	360	202	312	4.6
2	Bengal Gram Dhal (Harbara dal)	20.8	5.6	59.8	372	56	331	5.3
3	Bengal Gram, roasted (Phutana)	22.5	5.2	58.1	369	58	340	9.5
4	Black Gram, dhal (Uddachi dal)	24.0	1.4	59.6	347	154	385	3.8
5	Cow PEA (Chavli)	24.1	1.0	54.5	323	77	414	8.6
6	Field Bean, dry (Papta)	24.9	0.8	60.1	347	60	433	2.7
7	Green Gram, whole (Mug)	24.0	1.3	56.7	334	124	326	4.4
8	Green Gram, dhal (Mug dal)	24.5	1.2	59.9	348	75	405	3.9
9	Horse Gram, whole (Kuleeth)	22.0	0.5	57.2	321	287	311	6.77
10	Khesari, dhal (Lakh dal)	28.2	0.6	56.6	345	90	317	6.3
11	Lentil (Masur dal)	25.1	0.7	59.0	343	69	293	7.58
12	Moth Beans (Matki)	23.6	1.1	56.5	330	202	230	9.5
13	Peas green (Vatana)	7.2	0.1	15.9	93	20	139	1.5
14	Peas dry	19.7	1.1	56.5	315	75	298	7.05
15	Peas roasted	22.9	1.4	58.8	340	81	345	6.4
16	Rajmah (Shravangheveda)	22.9	1.3	60.6	346	260	410	5.1
17	Red gram, dhal (Turdal)	22.3	1.7	57.6	335	73	304	2.7
18	Redgram (tender)	9.8	1.0	16.9	116	57	164	1.1
19	Soyabean	43.2	19.5	20.9	432	240	690	10.4

Source : Nutritive Value of Indian Foods, National Institute of Nutrition, (ICMR), Hyderabad.

Water is sprinkled twice or thrice a day, because humidity and warmth are essential for germination. The most popular preparation made from germinated legumes is *usal*.

Advantages:

1. It reduces cooking time.
2. Starches and proteins are converted to simpler substances, thereby improving the digestibility and availability of nutrients.
3. Vitamin B complex and vitamin C content increases.
4. Germinated pulses add variety to diet.
5. Germination imparts sweet taste and soft texture, hence the sprouted legumes like green gram can be consumed raw or slightly cooked.
6. It does not produce gas or flatulence.

Disadvantages:

1. The nutrients loss may take place if the water in which the pulses are soaked is not used.
2. Over sprouting may result in the development of unpleasant flavour or taste.

Fig. 10.14 Sprouted Legumes

d. Fermentation – Soybean is the important example of fermentable pulses. Some fermented products of soybean are soya sauce, soybean paste, tempeh and natto.

Fig. 10.15 Tempeh

Advantages:

1. Increases in vitamin C and vitamin B Complex.
2. It improves the texture and flavour of the products.
3. Increases the digestibility, palatability and nutritional value of the product.
4. Toxic substances can be eliminated by fermentation.
5. It also imparts specific aroma and taste to the product.
6. It makes the product light and fluffy.

Disadvantages:

1. Store-bought items lose beneficial bacteria.

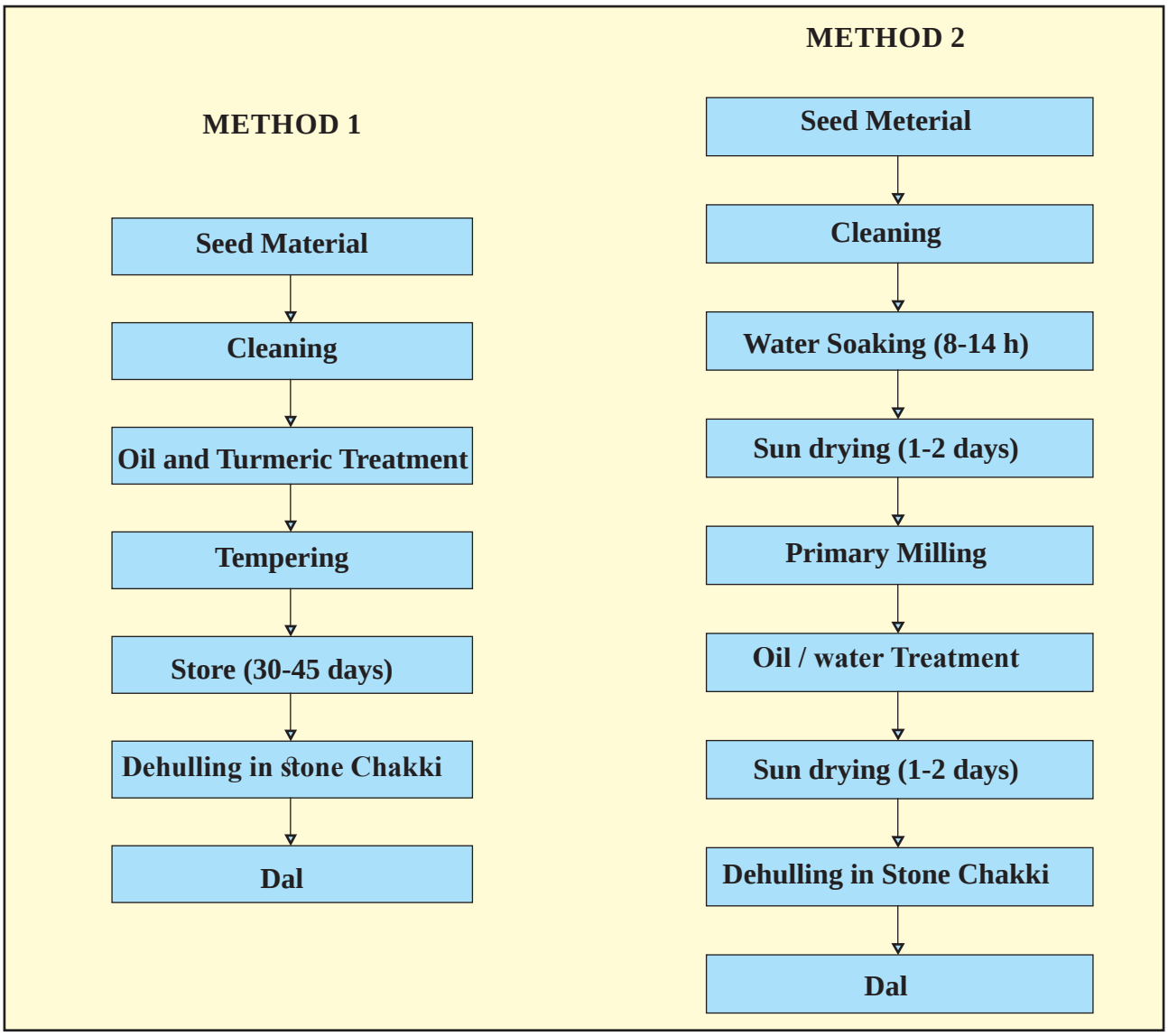
10.6 Use of pulses in cookery:

a. Thickening: Thickening agents give body, consistency and palatability when used. Pulses are used as thickening agent and prevent curdling e.g. bengal gram flour in *kadhi*, *pithala* and vegetable curries.

Fig. 10.16 Pithala (Thickening agent)

b. Binding: Binding agents are used to form a mixture of ingredients into a cohesive mass. They are used in desserts, potato and *mirchi bhajiya*. Bengal gram flour is used in preparation of leafy vegetables e.g. *sambharvadi*.

Fig. 10.17 Sambharvadi (Binding)



Source : Indian Institute of Pulses Research, Kanpur

Fig. 10.18 : Dal making process developed by Andhra Pradesh and Maharashtra (Method 1) and Madhya Pradesh and Maharashtra (Method 2)

c. **Coating:** It helps to give a coating to the food items and prevent them from disintegrating. Bengal gram flour is used in preparation of fried groundnut snacks, fried fish, *potato wada*, *Paneer Pakoda*, Mushroom *Pakoda and cutlets.*

Fig. 10.19a. Fried Fish

Fig. 10. 19 b. Bhajiya

d. **Flavour Dispersion –** Pulses improve flavor and consistency of dal. Some amount of dal is added in *masala powders*, which helps in uniform dispersion of flavour in the preparation like *sambhar*.

Fig. 10.20 Sambhar

e. **Garnishing –** Sev is prepared from besan which is used for garnishing *pani puri*, *pohe*, *upama*, *sevpuri* and *misal*.

Fig. 10.21 (a) Garnishing of panipuri

Fig. 10.21 (b) Garnishing of Shevpuri

ACTIVITY – 1

Aim: - To find out the effect of suitable condition on seeds

Materials needed:- Jars, wet paper towel or cotton, seeds ,water

Method:-

1. To start, fill a jar with wet paper towels.
2. Make sure to wring out the paper towels so there is no excess water in the jar.
3. Then place seeds in the jar, near the bottom half of the jar.

Observations:- Check the seedlings for their germ length and determine the germination time. For further experiments you can compare germination characteristics for different seeds types.

Conclusion:- Germination is a process, which not only reduce cooking time but increases the nutritive value, appearance and texture.

10.7 Anti-Nutritional factors of pulses and their elimination:

Anti-nutritional factors are natural chemical compounds which reduces bioavailability of vital nutrients. These are generally found in legumes and pulses. Details of anti-nutritionl factors and their elimination techniques are given in table below :

Table 10.4 Anti nutritional factor of pulses and their elimination

Sr. No.	Anti-nutritional Factor	Effect of Anti-nutritional factor	Pulses in which it appears	Detoxification Technique
1.	Lectins	Reduce the bioavailability of nutrients, which is due to direct action of lectin on digestive enzymes	Lentil, pea, pigeon pea, rice bean	Preliminary soaking prior to autoclaving cooking
2.	Tannins (Polyphenol)	Responsible for low protein digestibility and decreased amino acid availability	Cow pea, chickpea, pigeon pea, mung bean urd bean and pea	Tannins mainly appears in seed coat so that dehulling can reduce tannins.
3.	Protease inhibitors	Inhibit the activity of proteolytic enzymes.	Pigeon pea, kidney bean, lentil, chick pea	Heating, germination autoclaving and soaking
4.	Phytic acid	Affects the mineral bioavailability	Chinas legumes, pea, faba pea, dry bean, lentil and black bean	Roasting, germination, soaking, cooking
5.	Lathyrogen	If consumed in excess quantity for long time, it causes paralysis in the legs.	Lathyrus	Soaking, parboiling, roasting, germination
6.	Saponins	Saponin reduces the nutritive value of pulses	Chickpea, mung bean and pigeon pea	Soaking, germination, cooking
7.	Oligosaccharides	Accumulation of flatulence(gas disorder) in the intestinal tract results in discomfort, abdominal rumblings, cramps, pain, diarrhoea etc.	Red gram, chick pea, black gram and green gram	Soaking, germination, cooking

Oilseeds :

Oil seeds are the seeds from which oil can be extracted. Oilseeds constitute a very important group of commercial crops in India. The residue extracted after oil that is oil-cake, used as protein rich food and cattle feed, etc.

10.8 Composition and nutritional values of oilseeds:

Due to high quality protein, fat, oil soluble vitamins like vitamin A, vitamin E, oilseeds add important nutritional value to diet. Oilseeds are considered as the main source of high quality vegetable oils. Oilseeds have high fat content and many of them are rich in protein. They are considered as concentrated source of energy. Groundnuts are particularly rich in B-complex vitamins. Soybeans are rich in protein (Table 10.5).

10.9 Uses of oilseeds and nuts in cookery:

1. **Decorating:** Oilseeds and nuts are used for decoration purpose in many preparations. Cashew nuts, pista, almonds are used in *halwa, kheer, sheera, laddus, shrikhand,* ice cream etc., coconut on *poha,* cashew nut on *pulav,* sesame seeds on buns and *bhakri*.
2. **Thickening:** Coconut, gingelly seeds, ground nut, cashewnut are ground and used as thickening agent in the preparation of gravies.
3. **Flavourings:** They impart as desirable flavour to products like soups, porridge and kheer.
4. **Identity of grain:** While preparing *sago khichadi* or *sago wada*, it is difficult to maintain the identity of grain and prevent sogginess without adding crushed groundnuts to it.
5. **Extraction of oil:** Vegetables oils are extracted from oil seeds which are used as cooking media e.g. groundnut, soybean, coconut, sunflower, gingelly seeds etc.
6. **Snacks:** Roasted or fried and salted groundnuts and cashew nuts are used as snacks e.g. salted cashew nuts and groundnuts.
7. **Sweets:** Groundnut, sesame seeds and cashew nuts are roasted, powdered and used for sweet preparations like *chikki, burfi, halwa, groundnut laddu, til vadi til laddu* etc.

Fig. 10.22 : Major oilseeds of India

Do You Know ?

Soy products such as tofu, tempeh, etc. are among the richest sources of protein in a vegetarian diet.

Table 10.5: Nutritive values of Major Oilseeds (per 100 gram)

Name	Moisture (g)	Protein (g)	Ash (g)	Total Fat (g)	Total Fibre (g)	Carbohydrate (g)	Energy KJ
Ground nut	6.97	23.65	2.11	39.63	10.38	17.27	2176
Mustard seed	5.67	19.51	3.73	40.19	14.10	16.80	2132
Linseed or Flax	5.48	18.55	3.15	35.67	26.17	10.99	1857
Sesamum or Gingelly seed	3.30	21.70	4.13	43.05	16.99	10.83	2174
Soybean seed	5.51	35.58	4.74	19.82	21.55	12.79	1596
Sunflower seed	3.53	23.53	3.44	51.85	10.80	6.85	2453
Coconut, kernel, dry	3.97	7.27	1.61	63.26	15.88	8.01	2611
Garden cress seeds	4.60	23.36	6.37	23.74	8.27	33.66	1863

Source: T. Longvah, R. Anathan, K. Bhaskarachary and K. Venkaiah (2017), Indian Food Composition Tables, National Institute of Nutrition, Hyderabad, India.

Points to remember

- Cereals are classified into two groups namely Major (Fine) and Minor (Coarse)
- Coarse cereals are also known as millets.
- The nutritive value of the product decreases as the extent of milling increase.
- When dry heat is applied to cereals (starch) dextrinisation takes places.
- When moist heat is applied to starch, gelatinisation takes place.
- When water is added to wheat flour and kneaded, an elastic soft dough is formed that gives a soft texture due to gluten formation.
- Pulses are an important source of protein in Indian diet.
- Processing techniques like soaking, germination, fermentation improve the quality of pulses.
- Pulses are used in cookery as a thickening, binding, coating, dispersion and garnishing purposes.
- Oilseeds are rich in protein, fat & B-Complex vitamins.
- Oilseeds are used to extract oils.
- Oilseeds are used in cookery for decorating, thickening, flavouring, snacks and sweets.

Exercise

Q. 1 (a) Select the most appropriate options:

i. Cereal word is derived from greek word 'Ceres' which means goddess of _____.

(Air, Agriculture, Water).

ii. As the extent of milling increases, nutritive value of product _____.

(Increases, Decreases, Remain the same.)

iii. _____ is formed when Dalia is milled.

(Semolina, Wheat, Pulses).

iv. _____ is a process of passing dough from a cylinder by applying high pressure and getting various desired shape and length of product.

(Drying, Packaging, Extrusion).

v. Dextrinisation is a process in which _____ heat is applied to starch.

(Moist, Steam, Dry).

vi. _____ is the process in which moist heat is applied to starch.

(Dextrinization, Gelatinization, Fermentaion)

vii. _____ are the cheapest and rich source of protein.

(Cereals, Pulses, Oilseeds)

viii. _____ are the seeds from which oil can be extracted.

(Cereals, Pulses, Oilseeds)

(b) Match the following:

A		B	
i.	Dextrinisation	a.	Custard
ii.	Gelatinisation	b.	Fermented food
iii.	Gluten network	c.	Toast
iv.	Parboiled rice	d.	Glutenin and gliadin
v.	Dosa	e.	Idli
vi.	Oilseed cake	f.	Germination
		g.	Cattle feed

(c) State whether the following statements are true or false:

i. Cereals are rich source of starch.

ii. Application of moist heat is known as dextrinization.

iii. Pulses are main sourcs of fat.

iv. Germination decreases nutritive value of pulse.

v. Fermentation improves the texture of the product.

vi. Oil seeds have high fat content and many of them are rich in protein.

Q. 2 Short Question

i. Why *atta* is better than *maida*, explain?

ii. Why do *chapatis* swell on heating?

iii. How do we get different shapes and lengths of pasta?

iv. What are the different sources of vegetable oils?

v. Enlist the oilseeds, which are rich in protein.

Q. 3 Short answer questions

i. What are the various products formed during milling of wheat?

ii. Draw the flowchart of steps of pasta making.

iii. List the various types of rice.

iv. Define Dextrinisation.

v. Define Gelatinization

vi. Give physical and chemical changes in batter during fermentation.

vii. Advantages of germination of legumes and pulses.

viii. Soaking process

ix. Process of decortication

x. Draw the flowchart of steps of *dal* making in A.P. and Maharashtra.

xi. Draw the flowchart of steps of *dal* making in M.P. and Maharashtra.

Q. 4 Long answer questions

i. Explain the various steps of making pasta with the help of flowchart.

ii. Explain gluten network with the help of diagram.

iii. What do you understand by fermentation? Give its uses and advantages.

iv. Explain the uses of pulses in cookery.

v. Explain the functions of oilseeds in cookery.

❖ Project:

i. Select any ten recipes where cereal / pulses / oilseeds is used as the main ingredient. Prepare an attractive booklet of these recipes with their ingredients, amounts used and method of preparation.

ii. Collect information about various pasta products available in the market. Select five recipes in which these products are used and prepare an attractive booklet.

iii. Collect information about the latest breakfast cereals available in the market and prepare an attractive booklet.