

Wheat

Triticum spp. (x = 7)

Family: Poaceae

Origin of Wheat:

Cultivation of wheat started after 8000 BC. Jared Diamond traces the spread of cultivated emmer wheat starting in the Fertile Crescent about 8500 BC. Archaeological analysis of wild emmer indicates that it was first cultivated in the southern Levant with Iran as far back as 9600 BC. Genetic analysis of wild einkorn wheat suggests that it was first grown in the Karacadag Mountain in South eastern Turkey.

Remains of harvested emmer from several sites near the Karacadag Range have been dated between 8600 (at Cayonu) and 8400 BC (Abu Hureyra). That is in the Neolithic period. Iraq-ed-Dubb is the exception where the earliest Carbon dated remains of domesticated emmer wheat were found is the earliest levels of Tell Aswad, in the Damascus basin near Mount Hermon in Syria.

The cultivation of emmer reached Greece, Cyprus and India by 6500 BC, Egypt after 6000 BC and Germany and Spain by 5000 BC. The early Egyptians were developers of bread or the use of over and developed baking into one of the first large-scale food production industries.

By 3000 BC, wheat had reached England and Scandinavia A millennium later it reached China. The first identifiable bread wheat (*Triticum aestivum*) with sufficient gluten for yeasted breads has been identified using DNA analysis in samples from a grainary dating to approximately 1350 BC at Assiros in Greek Macedonia.

Wheat (*Triticum* sp.) is a cereal grain originally from the Levant region of the near East and Ethiopian Highlands. It is now cultivated worldwide. In 2010 the world production of wheat was 65 million tons. It is the third most produced cereal after maize (844 million tons) and rice (672 million tons).

Wheat is the leading source of vegetable protein in human food, having a higher protein content than other major cereals, maize and rice. The wheat crops are easily cultivated on large scale.

Wheat contributed to the emergence of city states in the Fertile Crescent including Babylonian and Assyrian empires.

It is a staple food used to prepare many items like bread, biscuit, cookies, cakes, breakfast, cereal, pasta, couscous, noodles. Fermentation is done to make beer, alcoholic beverages and bio-fuels.

It is a forage crop for live stock. Straw of wheat can be used as a construction material for roofing thatch. After removing bran and grain from the whole grain endosperm is milled to form white flour. Whole grain is source of vitamins, minerals and proteins. The refined grain has starch only.

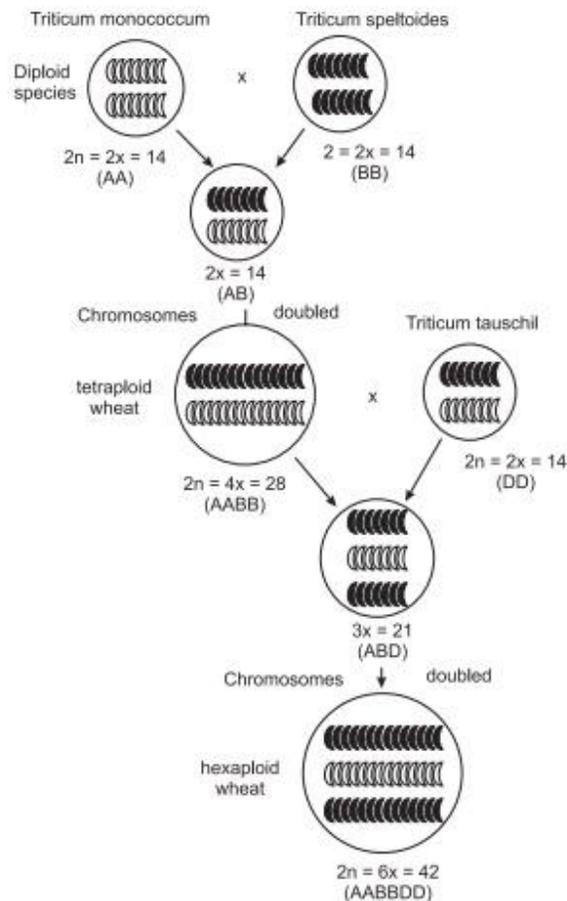


Figure 3.3 The evolution of hexaploid bread wheat from its wild relatives. Both einkorn (*T. monococcum*) and emmer (*T. dicoccum*) are found in the Fertile Crescent.

Cultivation of Wheat:

The major varieties of wheat cultivated are as follows:

1. Diploid species:

Einkorn wheat (*Triticum monoccunum*):

It is a diploid species with wild and cultivated varieties. It was domesticated at the same time as emmer wheat, but never reached the same importance.

2. Tetraploid species:

Durum wheat (*Triticum durum*):

This is the only tetraploid wheat grown in ancient times.

3. Hexaploid species:

Bread wheat (*Triticum aestivum*):

It is the most widely cultivated hexaploid species of wheat, commonly used variety in the world.

Spelt wheat (*Triticum spelta*):

It is also a hexaploid species but cultivated in limited quantities. Previously it was considered as a variety or subspecies of Bread wheat and called *Triticum aestivum* sub sp. *spelta*.

Morphology

Plant height: Wheat is typically from 0.7 to 1.2 m tall.

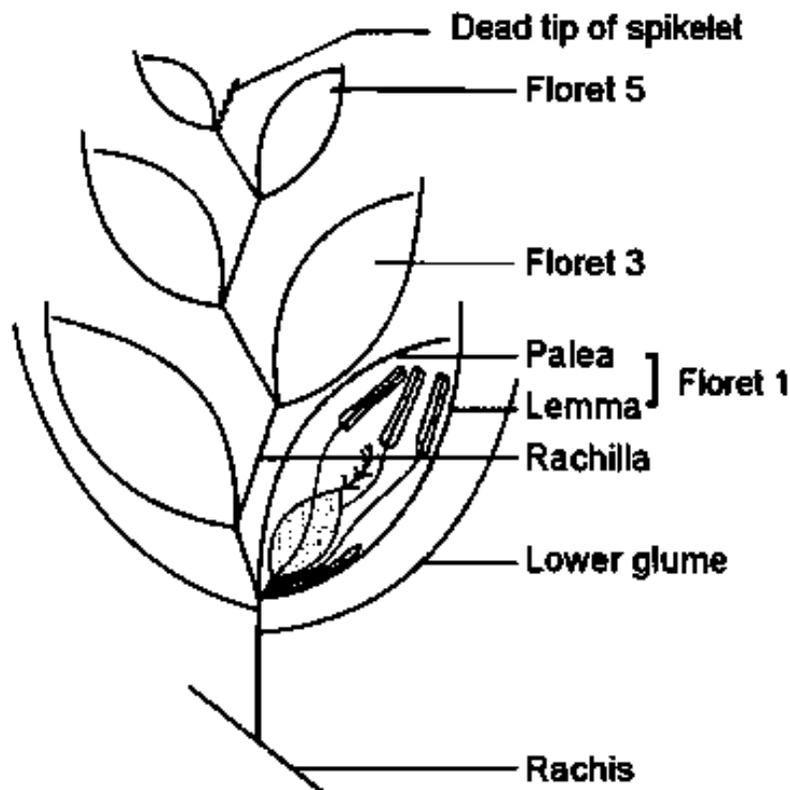
Roots: Wheat produces both seminal and nodal (or crown or adventitious) roots. The seminal roots form from the seed. The nodal roots form from the lower nodes, are associated with tillers and become increasingly important as the plant grows

Stem & tillers: Wheat has a single main stem plus typically 2-3 tillers per plant. The number of tillers tends to increase with better growing conditions and with a lower crop density. Tillering starts at the 3-4 leaf stage; approximately when the first nodal roots can be seen.

Leaves: Wheat leaves form at each node and include a leaf sheath that wraps around the stem and a leaf blade. Wheat has small auricles. These wrap around the stem at the point where the leaf sheath meets the leaf blade.

Spike: The spike (also called the ear or head) forms at the top of the plant. A spike usually has 35-50 grains (or kernels).

Grain: Wheat grain typically weighs 30-60 mg (i.e., 30-60 g/1000 grains) depending on variety and growing conditions. Reduced grain size often indicates moisture stress during grain filling.



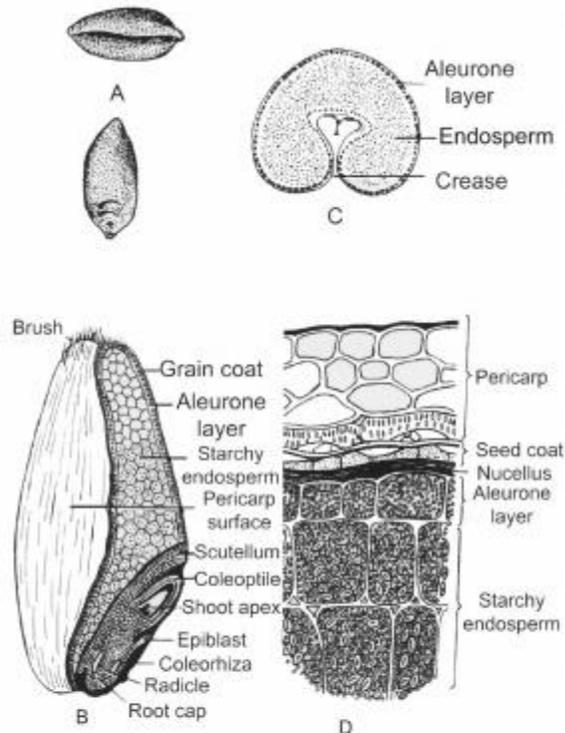


Figure. Anatomy of the wheat grain: (A) dorsal and ventral views of the kernel, (B) diagrammatic longitudinal section through the caryopsis, (C) cross section of the wheat grain showing the crease and the endosperm cells. The dark cells near the periphery constitute the aleurone layer of the endosperm and (D) magnified view of the transverse section through the pericarp, aleurone layer and part of the starchy endosperm. Note the concentric type of starch grains.

Cultivation, Harvesting and Threshing of Wheat:

In northern India sowing of wheat is done in October-November. Wheat may be sown broadcast, either by hand or by sowing machines. Germination begins immediately and the first leaves appear within a fortnight. Wheat is properly manured and irrigated.

The crop is harvested by cutting the plants with a sickle close to the ground, in March-April. Threshing is the next process, and this involves the separation of the grain from the spike. Threshing is generally done under the feet of bullocks or by threshing machines.

After threshing the wheat is winnowed and sifted. In the Punjab, recently the combines are introduced for the purpose. The combines reap, clean, thresh, winnow and sift the grains; wheat must be stored in firmly built structures, and it must be well ventilated.

Milling of Wheat:

In India in most of the motor driven flour mills there remains a fixed lower stone upon which a movable upper one revolves. The grains are dropped in the openings in the upper stone and gradually worked out between the stones which possess grinding surfaces cut in radiating lines. In this process whole grain is used.

The roller process of milling is an advanced and perfect process. The first step in this process comprises cleaning and scouring. After making the grains clean they are thoroughly washed and scoured. The next step is tempering.

In this process a little water is added, which toughens the bran and prevents its breaking up, so that it will flake out all in one piece. In the last the conditioned and tempered wheat is submitted to breaking, grinding and rolling.

The grain is first cracked or crushed gradually through a series of four to six pairs of chilled iron break rolls. The surface of the break rolls is made rough by sharp lengthwise folding. The break flour is separated out by sieves, while the main portion goes to the second break.

This process is repeated until five sets of rollers have been utilised. All bran is removed during this process and the purified material is passed to smooth rollers for final granulation. The final product is the flour.

Uses of Wheat:

There are three main kinds of flour—maida, and ata which are used for various purposes. The flour is used chiefly for making ‘bread’ and ‘chapatis’. The flour is also used for making biscuits, cakes, pastry and similar articles. Wheat flakes are used as breakfast food.

Wheat is also used in the manufacture of beer and other alcoholic beverages. Wheat straw is used for seating chairs, stuffing mattresses, etc. It makes a good food for livestock. Wheat straw is also used as fodder.

This makes a staple food in most parts of the world. Properties of gluten in the grains are such that It produces bread-stuffs generally superior to those from any other cereal grains By products

of wheat milling, such as bran, germ and middling's constitute valuable feed for stock readily eaten; supplementary feeds are provided to supply protein and minerals in which the straw is deficient.

The straw is used as bedding for cattle; it is also used for padding, as in mattresses for packing fragile goods, for thatching and many other purposes. It may be used also for production of furfuryl alcohol. Straw-pulp is utilized for the manufacture of paper, straw-board and building-board.

Non-feed industrial uses of wheat include the manufacture of starch, industrial alcohol, malted wheat, and core-binder flour; only small quantities of wheat are used for starch and gluten manufacture. Gram is regarded as a stand-by for alcohol production. Low-grade flours are utilized in the preparation of pastes for wall papering and ply-wood adhesives, and in iron foundries as a core binder.

Wheat products include peeled wheat; Bulgur, a parboiled wheat product; World wheat similar to Bulgur, but of lighter colour; Instant or agglomerated flour; Farina or semolina-. Wheat flakes- Shredded wheat; Puffed wheat; Grape-nuts, prepared from toasted slices of malted bread; Gluten, used in special breads; and wheat germ, rich in vitamin E.