

06. Botanical description and floral biology

Cereals

Characters of Cereals

□ Most of the cereals are herbaceous annuals. □ Stem or culm often erect, cylindrical, hollow except at nodes. Tillering habit, shallow fibrous root system. □ Leaves alternate, distichously with parallel venation and sheathing leaf base. □ Presence of ligules, lodicules
□ Inflorescence is panicle or spike □ Stamens usually three (in rice- six). Fruit is a caryopsis.

Rice – *Oryza sativa* L. (2n = 24)

Systematic Position:

Division : Phanerogams

Sub-Division : Angiosperms

Class : Monocotyledon

Series : Glumacea

Sub class : Glumiflorae

Family : Poaceae

Sub family : Poaideae

Tribe : Oryzeae

Origin: India or Africa

Putative parents and origin of cultivated rice

There are two divergent views regarding the origin of cultivated rice.

i. **Polyphyletic:** Originated from several species.

According to this theory, the two forms of cultivated rice viz., Asian rice *O. sativa* and African rice, *O. glaberrima* have evolved independently in their respective regions from several species.

ii. **According** to this theory both Asian rice and African rice arose from a common parent. (*O. perennis*). This view is the most accepted one because both Asian rice and African rice are similar except in glume pubescence, ligule size and colour of pericarp which is red in African rice.

Species in the genus *Oryza*

According to the latest view the genus *Oryza* include 22 valid species. Out of these, two are cultivated diploids viz. *O. sativa* and *O. glaberrima* and rest are wild species with include both diploid and tetraploid forms.

Subspecies in cultivated *Oryza sativa*

Rice has been in cultivation for long period and adapted well under diverse climatic conditions and soils. This has resulted in the evolution of three geographical races which has been given subspecies status. The three subspecies are:

- i. *O. sativa* subsp **indica** : Tall spreading, more tillering, awnless
- ii. *O. sativa* subsp **japonica** : Short, erect, more tillering, awnless
- iii. *O. sativa* subsp **javanica** : Tallest, erect, poor tillering, awned

Marked sterility barriers occur between the subspecies. It ranges up to 80% in case of indica x japonica where as it is less in case of indica x javanica.

Wheat – *Triticum sp.* (X = 7)

Wheat is the most important cereal in the world, giving about one-third of the total production, followed closely by rice. In temperate regions it is the major source of food. The chief use of wheat is the flour for making bread.

Systematic position:

Division : Phanerogams

Sub-Division : Angiosperms

Class : Monocotyledon

Series : Glumacea

Sub class : Glumiflorae

Family : poaceae

Tribe : Triticeae

Subfamily : Pooideae

Chromosome number:

Diploid : $2n = 14$, **Tetraploid** : $2n = 28$, **Hexaploid** : $2n = 42$

Place of Origin:

Diploid: Asia minor, **Tetraploid :** Abyssinia, North Africa, **Hexaploid :** Central Asia

Classification:

Ploidy level	Species	Common name	Genome
Diploid (2n=14) 2 species	<i>T.boeiticum</i>	Wild einkorn	AA
	<i>(T.aegilopoides)</i>	Einkorn	AA
	<i>T.monococum</i>		
Tetraploid (2n=28) 7 species	<i>T.dicoccoides</i>	Wild Emmer	AA BB
	<i>T.dicoccum</i>	Emmer	AA BB
	<i>T.durum</i>	Macaroni wheat	AABB
	<i>T.persicum</i>	Persian wheat	AABB
	<i>T.turgidum</i>	Rivet wheat	AABB
	<i>T.polonicum</i>	Polish wheat	
	<i>T.timopheevi</i>	-	
Hexaploid (2n= 42) 5 species	<i>T.aestivum</i>	Common or bread	AABBDD
	<i>T.compactum</i>	wheat	AABBDD
	<i>T.sphaerococcum</i>	Club wheat	AABBDD
	<i>T.spelta</i>	Dwarf wheat	AABBDD
	<i>T.macha</i>	Spelt wheat	AABBDD
		Macha wheat	

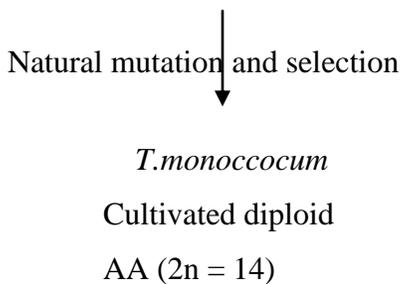
Fourteen species of wheat are present according to Vavilov



- | | |
|-----------------------------|---------------------------|
| 1. <i>T. boeoticum</i> | 2. <i>T. monococcum</i> |
| 3. <i>T. dicoccoides</i> | 4. <i>T. dicoccum</i> |
| 5. <i>T. durum</i> | 6. <i>T. persicum</i> |
| 7. <i>T. turgidum</i> | 8. <i>T. polonicum</i> |
| 9. <i>T. timopheevi</i> | 10. <i>T. aestivum</i> |
| 11. <i>T. sphaerococcum</i> | 12. <i>T. compactum</i> , |
| 13. <i>T. spelta</i> | 14. <i>T. macha.</i> |

Origin of diploid wheat:

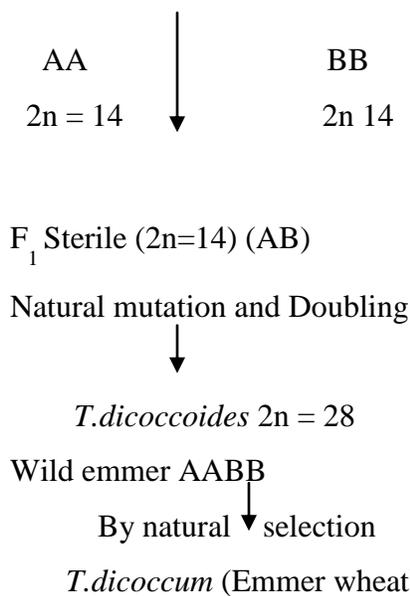
(Wild einkorn) *T. boeoticum* (*T. aegilopoides*)



T. boeoticum is probably the ancestor for all the cultivated wheats

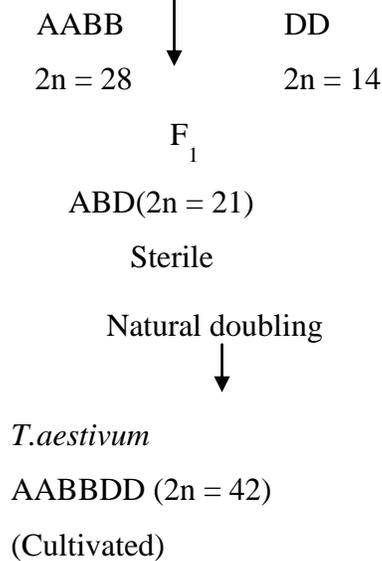
Origin of Tetraploid wheats:

T. boeoticum x *Aegilops speltoides*



Origin of hexaploid wheats (Fig.2):

T. dicoccum x *Aegilops squarrosa*



AABB (2n=28) Cultivated

Structure of Wheat Grain

Fruit is a dry, one seeded indehiscent fruit known as caryopsis. The grain may be either hard or soft in texture with a creamy white, amber, red or purple colour depending upon variety. The dorsal (back side) convex surface of kernal is smooth except at the base where the fruit coat is wrinkled indicating the position of embryo the ventral surface (front side) is flat and characterised by a deep furrow or groove.

The following 4 structures are recognized in wheat grain

i. Grain coat, ii. Nucellar epidermis, iii. Endosperm and iv. Embryo.

