Heredity and Evolution

Heredity refers to the transmission of characters from parents to offsprings.

Mendel's contribution:

The rules for inheritance of traits in human beings are related to the fact that both mother and father contribute an equal amount of genetic material i.e. DNA to their offspring. So an offspring will get two versions of that trait from the two parents. Mendel worked out rules for inheritance of these traits. Gregor Johann Mendel regarded as the 'Father of Genetics' performed his experiments with garden peas (Pisum sativum) in the garden behind his monastery. He observed a number of contrasting characters in garden peas and observed their inheritance.

Some important terms :

1. **Chromosomes** are long thread-like structures present in the nucleus of a cell which contain hereditary information of the cell in the form of genes.

2. **DNA** is a chemical in the chromosome which carries the traits in a coded form.

3. **Gene** is the part of a chromosome which controls a specific biological function.

4. **Contrasting characters**: A pair of visible charactes such as tall and dwarf, white and violet flowers, round and wrinkled seeds, green and yellow seeds etc.

5. **Dominant trait**: The character which expresses itself in a (Ft) generation is dominant trait. Example : Tallness is a dominant character in pea plant.

Recessive trait: The character which does not express itself but is present in a generation is recessive trait. Ex. Dwarfism in the pea plant.

6. **Homozygous**: A condition in which both the genes of same type are present for example; an organism has both the genes for tallness it is expressed as TT and genes for dwarfness are written as tt.

7. **Heterozygous**: A condition in which both the genes are of different types for example; an organism has genes Tt it means it has a gene for tallness and the other for dwarfness only tall character is expressed.

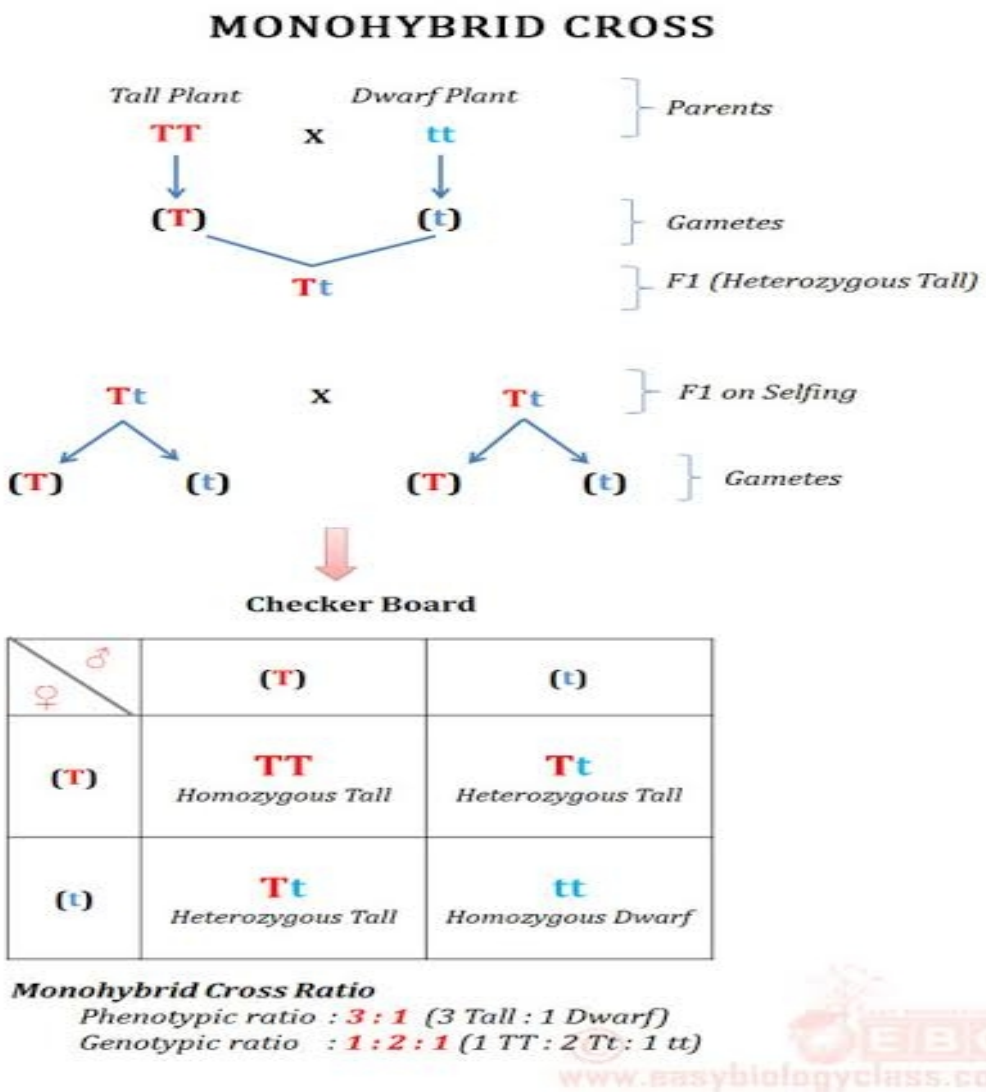
8. **Genotype**: It is genetic make up of an individual for example; A pure tall plant is expressed as TT and hybrid tall as Tt.

9. **Phenotype**: It is external appearance of the organism for example; a plant having Tt composition will appear tall although it has gene for dwarfness.

10. Homologous pair of characters are those in which one member is contributed by the father and the other member by the mother and both have genes for the same character at the same position.

Monohybrid Cross:

The cross in which Mendel showed inheritance of dominant and recessive characters is monohybrid cross. To observe inheritance of single pair of contrasting characters he took pure tall (genotype TT) and pure dwarf (genotype tt) pea plants and cross pollinated them to obtain first generation or first filial generation. In this figuration (F1 generation) he obtained only tall plants. This meant that only one of the parental traits was seen, not the mixture of the two. The plants of F generation or progeny are then self pollinated to obtain F2 generation or progeny. Now all plants were not tall. He obtained 75% tall plants and 25% dwarf plants i.e. the



phenotypic ratio was 3:1. This indicates that in the F, generation both tall and dwarf traits were inherited but tallness expressed it self. Tallness is a dominant trait and dwarfness is a recessive trait. F2 generation has a genotypic ratio of 1 : 2 : 1 of three types of plants represented by TT, Tt and tt as shown in the cross.

Conclusion: Phenotypic ratio—Tall : Dwarf 3 : 1
Genotype ratio—Pure Tall : Hybrid Tall : Pure Dwarf 1 : 2 : 1

Law of Dominance:

When parents having pure contrasting characters are crossed then only one character expresses itself in the Ft generation. This character is the dominant character and the character/factor which cannot express itself is called the recessive character.