

CHAPTER - 5

PRINCIPLES OF INHERITANCE AND

VARIATION

SYNOPSIS :

Inheritance :

Inheritance or heredity is the transmission of characters, resemblance and variations from one generation to next.

Variation :

It is the differences among members of species and off-springs of same parents.

Genotype and phenotype :

The genes on chromosomes regulating characters are called 'genotypes' and the physical expression of characters is 'phenotype'.

Mendel :

Mendel was the first to study phenomenon of inheritance systematically.

🌿 **Mendel's law of inheritance :**

Mendel proposed that the genes regulating the characters are found in pairs known as 'alleles'. The characters may be recessive or dominant.

🌿 **Mendel's laws of unit character :**

Hereditary traits are controlled by factors.

🌿 **Mendel's law of dominance :**

One factor of a pair may prevent the expression of other factor. One that expresses is dominant and the one that doesn't is recessive.

🌿 **Mendel's law of segregation :**

The two factors of a trait separate during gamete formation so that each male or female gamete carries a single factor.

🌿 **Incomplete and co-dominance :**

All characters do not show true dominance. Some characters show **incomplete dominance**. Some characters are dominating in combinations. Such phenomena is called '**co-dominance**'.

Punnett squares :

Punnett squares are used to predict the results of genetic crosses.

Law of Independent Assortment :

During the study of two characters together, it was found that the factors independently assort and combine in all permutations and combinations.

Chromosomal theory of inheritance :

Genes are located on the chromosomes. The pairing and separation of a pair of chromosomes during meiosis lead to the segregation of a pair of genes they carries.

Morgan :

Morgan carried out several dihybrid crosses in *Drosophila* to study genes that were sex-linked.

Recombination :

Genetic recombination is the mutual exchange of corresponding segments of adjacent paternal and maternal chromosomes in pachytene of meiosis I.

Linkage maps :

Linkage maps correspond to arrangement of genes on a chromosome.

 **Sex linked genes :**

Sex linked genes are linked to sexes also. The two sexes – male and female, were found to have a set of chromosomes which were common and another set which was different.

 **Sex chromosomes :**

Sex chromosomes are the ones that determine the gender of an individual.

 **Mutation :**

It is the change in genetic material. It arises by mutagens such as radiation, chemicals and temperature.

 **Chromosomal mutation** – occurs by deletion, inversion, translocation and duplication.

 Genetic disorders occur due to:

- (1) Numerical change in autosomes or sex chromosomes,
- (2) Mutation in autosomes or sex chromosomes,
- (3) Incompatibility of genes.