MIND MAP : LEARNING MADE SIMPLE

CHAPTER - 5

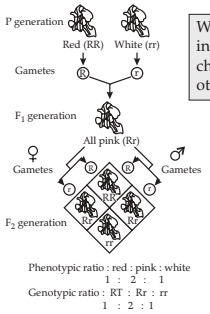
Principles of Inheritance and Variation

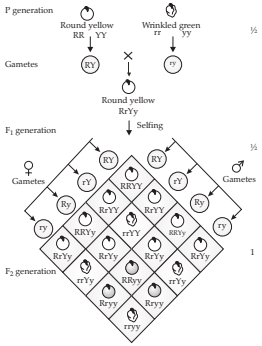
Gregor Mendel

- Studied 7 Pairs of contrasting characters of pea plant

S.No.	Characters	Contrasting Traits
1.	Stern height	Tall/dwarf
2.	Flower colour	Violet/white
3.	Flower position	Axial/terminal
4.	Pod shape	Inflated/constricted
5.	Pod colour	Green/yellow
6.	Seed shape	Round/ wrinkled
7.	Seed colour	Yellow/green

- Proposed three laws
  - Law of Dominance
    - In heterozygous condition only one member of a pair expresses its effect in the hybrid and is called as dominant while the manifestation of the other is masked and is known as recessive
  - Law of Segregation
    - During gamete formation, the factors (alleles) of a character pair present in parents segregate from each other such that a gamete receives only one of the two factors.
  - Law of Independent assortment
    - When two pairs of traits are combined in a hybrid, segregation of one pair of characteristics is independent of the other pair of characters.





Mendelian Disorders

- Autosomal dominant: E.g. Muscular dystrophy.
- Autosomal recessive: E.g. Sickle cell anaemia, Albinism
- Sex linked: E.g. Haemophilia.

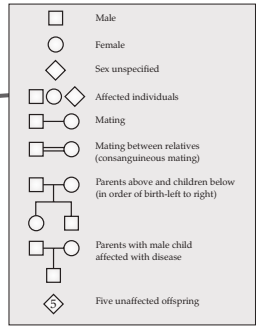
Chromosomal Disorders

- Example, Down's syndrom (trisomy of 21).
- Klinefelter's Syndrome (XXY in male).
- Turner's syndrome (XO in female).

Genetic Disorders

Pedigree Analysis

- Definition
  - Record of occurrence of a trait in several generations of a family.
- Symbol used



- Importance
  - Pedigree study is utilized to trace the inheritance of a specific trait, abnormality or disease.

Mutation

- Definition
  - Sudden heritable change in DNA sequence, which results in changes in the genotype and the phenotype of an organism.
  - Leads to variation in DNA.
- Frameshift Mutation
- Point Mutation

Sex Determination

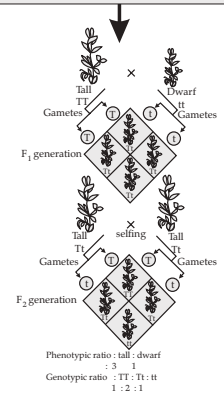
- ZZ—ZW mechanism
  Example, Birds
- XX—XO mechanism
  Example, grasshopper
- XX – XY mechanism
  Example, Human being

Chromosomal Theory of inheritance

- Proposed by Walter Sutton and Theodore Boveri in 1902.
- Thomas Hunt Morgan formulated chromosomal theory of inheritance using fruit flies *(Drosophila melanogaster)*.
- Morgan coined the term Linkage.

Non–Mendelian Inheritance

- Incomplete Dominance
  - One of the two alleles of a gene is incompletely sp dominant over the other allele. E.g., Flower colour in ***Antirrhinum** sp.* and ***Mirabilis jalapa.***



- Co-Dominance
  - Two alleles of a gene are equally dominant and express themselves even when they are together.
  - E.g. ABO blood grouping in human.
- Multiple Alleles
  - A gene exists in more than two allelic forms E.g., ABO blood grouping
- Pleiotropy
  - Ability of a gene to have multiple phenotypic effects as it influences a number of characters simultaneously.