



Principles of Inheritance and Variation

Lecture – 2

Alleles / Allelomorph: Genes which code for a pair of contrasting traits are known as alleles.

Seven pairs of contrasting traits in pea plant studied by Mendel

Trait studied	Dominant	Recessive
1. Plant height	Tall (T)	Dwarf (t)
2. Flower position	Axial (A)	Terminal (a)
3. Pod colour	Green (G)	Yellow (g)
4. Pod shape	Full or Inflated (I)	Constricted (i)
5. Flower colour	Violet (V)	White (v)
6. Seed shape	Round (R)	Wrinkled (r)
7. Seed colour	Yellow (Y)	Green (y)

Steps in making a cross in pea:

1. Selection of parents
2. Emasculation
3. Pollination
4. Bagging

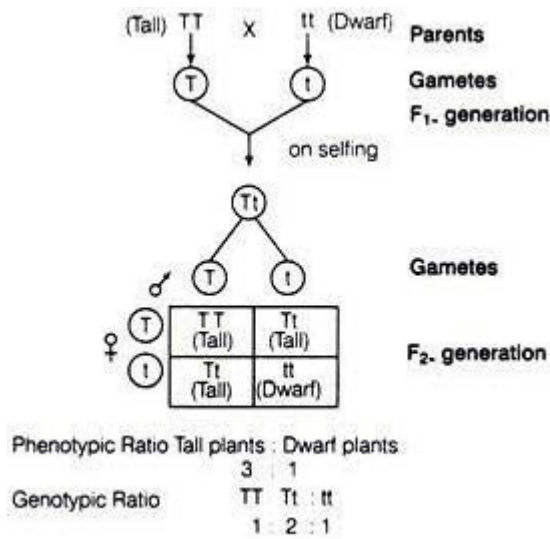
Terminology used in Mendel's experiment:

1. **Phenotype** – External appearance of an organism.
eg. Tall, Round etc.
2. **Genotype** – Genetic constitution of an organism.
eg. TT – Tall, tt – Dwarf
3. **Homozygous** – Individual with same alleles.
eg. TT, tt, RR
4. **Heterozygous** – Individual with different alleles.
eg. Tt, Rr
5. **Dominant** – The character which is expressed in F₁ generation.
OR
Expressed in Homozygous and heterozygous condition.
eg. Tall, Round, Axial
6. **Recessive** – The character which is expressed in F₁ generation
OR
Expressed in only homozygous condition.
eg. Dwarfness, Wrinkled

Monohybrid cross : When a single pair of contrasting character is considered for cross it is known as monohybrid cross.

eg. Tall × Dwarf, Round × Wrinkled.

Monohybrid ratio : When a single pair of contrasting character is considered and phenotypic ratio obtained in F₂ generation is known as monohybrid ratio.



Law of Dominance:

- (i) Characters are controlled by discrete units called factors.
- (ii) Factors occur in pairs.
- (iii) In a dissimilar pair of factors one member of the pair dominates (dominant) the other (recessive).

The law of dominance is used to explain the expression of only one of the parental characters in a monohybrid cross in the F₁ and the expression of both in the F₂. It also explains the proportion of 3:1 obtained at the F₂.

Law of Segregation:

This law is based on the fact that the alleles do not show any blending and that both the characters are recovered as such in the F₂ generation though one of these is not seen at the F₁ stage.

Though the parents contain two alleles during gamete formation, the factors or alleles of a pair segregate from each other such that a gamete receives only one of the two factors. Of course, a homozygous parent produces all gametes that are similar while a heterozygous one produces two kinds of gametes each having one allele with equal proportion.

Biology

Single Correct Questions

1. Genotype refers to
 - (A) Genetic constitution of all organisms
 - (B) Genetic constitution of plastids
 - (C) Genetic constitution of an organism
 - (D) Genetic constitution of an organ
2. Phenotypic ratio 3:1 proves
 - (A) Dominance
 - (B) Segregation
 - (C) Crossing over
 - (D) Independent Assortment
3. Which of the following is significance of dominance ?
 - (A) Organisms with dominant genes are more vital
 - (B) Harmful mutations are not expressed due to dominant gene
 - (C) Heterosis is due to dominant gene
 - (D) All the these
4. A farmer planted 200 plantlets which produced 140 tall & 40 dwarf plants. The genotypes of these off springs are most likely.
 - (A) TT, tt
 - (B) TT, Tt, tt
 - (C) TT, Tt
 - (D) Tt, tt
5. Allele is the
 - (A) Alternate trait of gene pair
 - (B) Total number of genes for a trait
 - (C) Total number of chromosomes
 - (D) Total number of chromosomes of a haploid set.
6. F₂ generation is produced as a result of
 - (A) Crossing F₁ individuals with dominant parent
 - (B) Crossing F₁ individuals with recessive parent
 - (C) Crossing one of the parental individual with dominant individual.
 - (D) Crossing F₁ individuals amongst them selves.
7. Segregation of genes take place during which phase of cell division ?
 - (A) Metaphase
 - (B) Anaphase
 - (C) prophase
 - (D) Embryo formation
8. Checkerboard method of calculations was developed by
 - (A) Mendel
 - (B) Bateson
 - (C) punnett
 - (D) Morgan
9. Punnet square is used to know
 - (A) Out come of a cross
 - (B) probable result of a cross
 - (C) Types of gametes
 - (D) Number of gametes
10. First generation after a cross is
 - (A) First filial generation
 - (B) F₁ gneratioon
 - (C) Second filial generation
 - (D) Both (A) and (B)
11. The allele which is unable to express its effect in the presence of another is called
 - (A) Co - dominant
 - (B) Supplementary
 - (C) Complementary
 - (D) Recessive
12. Term allelomorphs implies to
 - (A) Any two characters
 - (B) Alternative forms of gene with contrasting characters
 - (C) Sex linked characters
 - (D) Pair of non contrasting characters