

# PRINCIPLES OF INHERITANCE AND VARIATION



**For Quick Revision and Smart Practice**

## **NEET FAST FORWARD**

An Innovation of **NEET** Experts with 30+ years of Blissful Teaching  
Experience and Inspiration of Lakh+ successful **MEDICO** professionals



**India's First e - Magazine with Live Testing**

# PRINCIPLES OF INHERITANCE AND VARIATION

## Introduction:

Genetics is the study of principles and mechanism of heredity and variation. Gregor Johann Mendel is known as 'father of Genetics'. important attributes to the reproductive health of a society.

## Inheritance:

Inheritance is the process by which characters are passed on from parent to progeny. It is the basis of heredity.

## Variation:

Variation is the degree by which progeny differ from their parents. Variation may be in terms of morphology, physiology, cytology and behavioristic traits of individual belonging to same species.

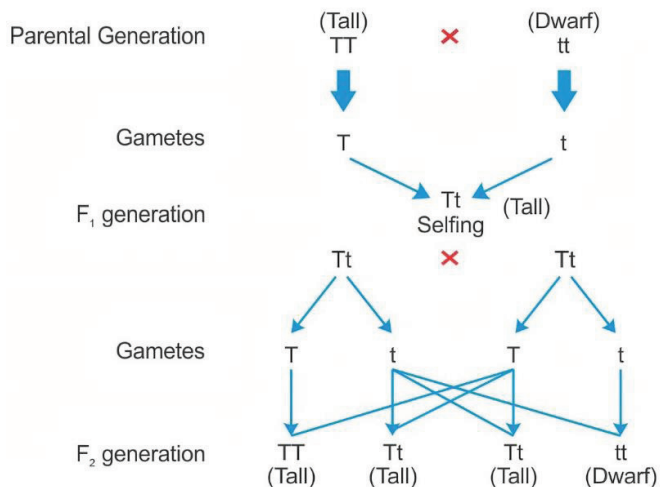
### Variation arise due to:

- Reshuffling of gene/ chromosomes.
- Crossing over or recombination
- Mutation and effect of environment.

## Inheritance of one gene (Monohybrid cross):

Mendel crossed tall and dwarf pea plant and collected all the seeds obtained from this cross. He grew all the seeds to generate plants of first hybrid generation called  $F_1$  generation. He observed that all the plants are tall. Similar observation was also found in other pair of traits.

Mendel self-pollinated the  $F_1$  plants and found that in  $F_2$  generation some plants are also dwarf. The proportion of dwarf plants is  $1/4$ th and tall plants of  $3/4$ th.



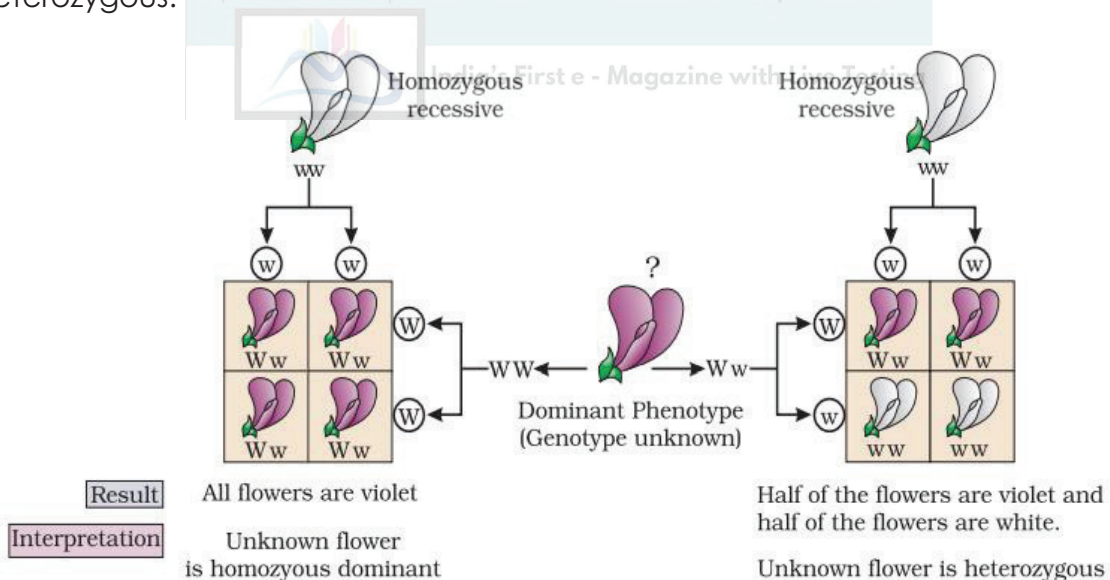
- Mendel called the 'factors' that passes through gametes from one generation to next generation. Now a day it is called as genes (unit of inheritance).
- Genes that code for a pair of contrasting traits are known as alleles.
- Alphabetical symbols are used to represent each gene, capital letter (TT) for gene expressed in F<sub>1</sub> generation and small letter (tt) for other gene.
- Mendel also proposed that in true breeding tall and dwarf variety allelic pair of genes for height is homozygous (TT or tt). TT, Tt or tt are called genotype and tall and dwarf are called phenotype.
- The hybrids which contain alleles which express contrasting traits are called heterozygous (Tt).
- The monohybrid ratio of F<sub>2</sub> hybrid is 3 : 1 (phenotypic) and 1 : 2 : 1 (genotypic).

**Dominance:** When a factor (allele) expresses itself in the presence or absence of its dominant factor called dominance. It forms a complete functional enzyme that perfectly express it.

**Recessive:** It can only express itself in the absence of or its recessive factor allele. It forms a incomplete defective enzyme which fails to express itself when present with its dominant allele, i.e., in heterozygous condition.

### Test cross:

Test cross is the cross between an individual with dominant trait and a recessive organism in order to know whether the dominant trait is homozygous or heterozygous.



### Mendel's Experiment:

Gregor Mendel, after performing his experiments on pea plants, discovered the

fundamental laws of inheritance. He proposed three laws of inheritance which we are studying to date. He has chosen pea plants having seven opposite traits of particular characters and conducted his experiment on 14 true-breeding pea plant varieties.

### **Mendel's Laws:**

There were 3 laws that were proposed by Mendel

**Law of Dominance:** It is explained in this law that all of the traits, or the characters are controlled by the unit called the factors. These factors are found to be in pairs and are called alleles. If they occur in the same pair they are called homozygous, they can be either dominant or recessive and if the alleles occur in a different pair then it is called heterozygous, It will always be dominant. "For example Allele for tallness is dominant over the allele for dwarfism".

**Law of Segregation of Genes:** Law of segregation is based on the fact that alleles do not show any blending and that both the characters are recovered as such in the second filial generation though one of these is not seen in the first generation. The segregation of factors or a pair of alleles occurs in such a manner that the gamete receives only one of the two factors from each other. Examples of the law of segregation of alleles. In this R is dominant over r.

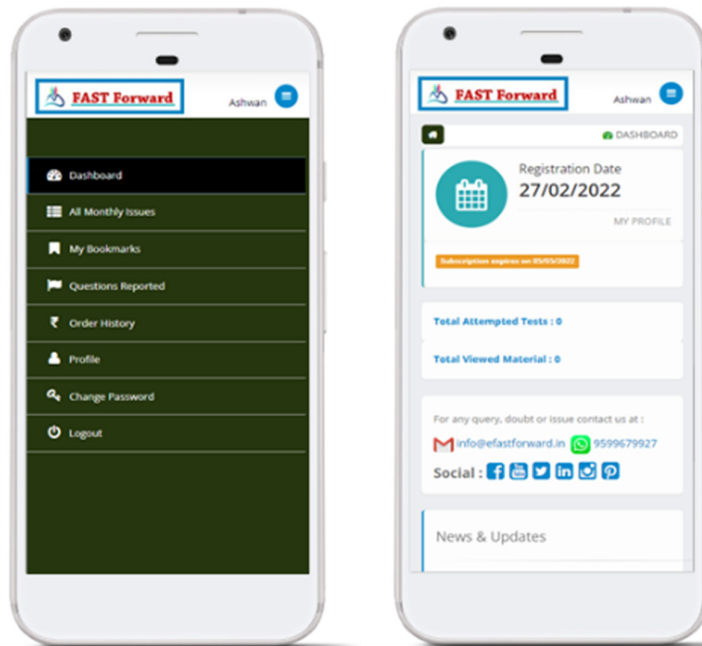
**Law of Independent Assortment:** It states that pairs of traits in the parental generation sort independently from one another when passing from one generation to the next. It is explained with the help of a dihybrid cross.

### **Inheritance of Two Genes (Dihybrid Cross):**

The inheritance of two genes requires two characters of the same trait. This can be observed with the help of a dihybrid cross. Mendel has chosen two traits that involve the color and the shape of the seed to explain the inheritance of two genes. Y represents the dominant yellow color seed color, y represents a recessive green color while R represents the round shape of the seed, and r represents the wrinkled shape of the seed. The genotype of the parents can then be written as RRYy and rryy. The gametes RY and ry will unite after fertilization and will produce the F<sub>1</sub> hybrid RrYy. The dihybrid cross is also useful in the study of the Law of Independent Assortment. After the self-pollination of the F<sub>1</sub> hybrid, the F<sub>2</sub> ratio was found to be 9 : 3 : 3 : 1.



**TO DOWNLOAD/VIEW FULL FILE**



[Download Android App](#)

Fast Forward a work of Adhipati Creations that provides the best app for NEET, JEE, BITSAT, CUET and CBSE exam preparation.