

CHAPTER - 9 HEREDITY AND EVOLUTION

The transfer of characters from parents to offspring is known as **heredity** and the process through which characters or traits pass from one generation to another is called **inheritance**.

Accumulation of Variations During Reproduction

The difference in the characters among the individuals of a species is termed as **variations**. These variations are accumulated by the process of **sexual reproduction**.

Heredity (Inheritance of Traits)

Traits or characteristics, which are passed on from parents to their offspring (generation to generation) are controlled by genes.

A gene is a unit of DNA which governs the synthesis of one protein that constants a specific character of an organism. e.g., Inheritance of free or attached earlobes.

Traits (Characteristics)

1. Inherited Traits
2. Acquired Traits

Inheritance Traits

- Transferred from parents to offspring.
- Traits include height, skin, colour, hair.
- These are genetic variations caused in reproductive tissues.

Acquired Traits

- Developed throughout the life time of the individual.
- Learning some Skill, knowledge we raised muscular development.
- These are somatic variations caused in non-reproductive tissue.

Some Important Terms and Definitions

Chromosome

A long thread-like structure in the nucleus. It appears during cell division and carries genes.

Gene

A functional unit of heredity. It is present on chromosome. It is a piece of DNA that codes for one protein that in turn determines a particular character (phenotype).

Character

The feature or characteristic of an individual like height, colour, shape. etc.

Trait

An inherited character. i.e., feature, which is normally inherited and has its detectable variant too, e.g., tall and dwarf are traits of a character, i.e., height.

Allele

One of the different forms of a particular gene, occupying the same position on a chromosome.

Dominant allele

An allele, whose phenotype will be expressed even in the presence of another allele of that gene. It is represented by a capital letter, e.g., T.

Recessive allele

An allele, which gets masked in the presence of a dominant allele and can only affect the phenotype in the absence of a dominant gene. It is represented by a small letter, e.g., t.

Genotype

Genetic composition of an individual.

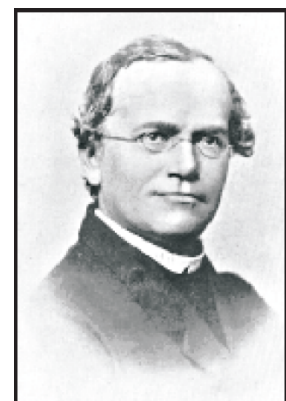
Phenotype

The expression of the genotype, which is an observable or measurable characteristic.

Father of Inheritance

The Austrian monk, Gregor Johann Mendel is known as Father of Genetics. He performed many experiments on pea (*Pisum sativum*) plant related to crossbreeding.

He studied seven pairs of contrasting characters in pea plants and only one character at a time.



Reasons for selecting pea plant

- Easy to grow
- Short life cycle (i.e., it is possible to study many generations.)
- It has 7 pairs of contrasting characters.

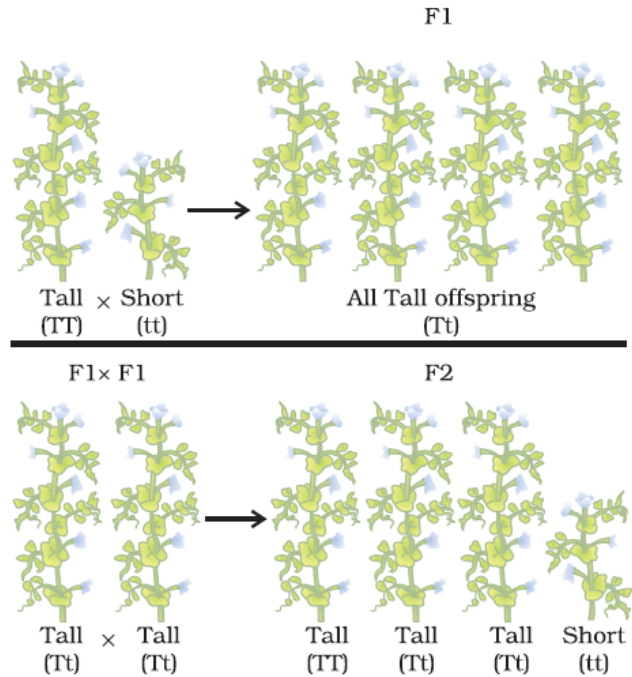
Table of contrasting characters, seven pairs

CHARACTER	DOMINANT TRAIT	RECESSIVE TRAIT
Flower Colour	Violet	White
Flower Position	Axial	Terminal
Seed Colour	Yellow	Green

Seed Shape	Round	Wrinkled
Pod Shape	Inflated	Constricted
Pod Colour	Green	Yellow
Height Of Plant	Tall	Dwarf/Short

Monohybrid Cross (Study of single trait)

- Mendel took pea plants with different characteristics such as height (tall and short plants).
- The progeny produced from them (F1 - generation plants) were all tall. Mendel then allowed F1 progeny plants to undergo self-pollination.
- In the F2 - generation, he found that all plants were not tall, three quarter were tall and one quarter of them were short. This observation indicated that both the traits of shortness and tallness were inherited in F2 - generation. But only the tallness trait was expressed in F1 -generation.



Thus, the phenotypic ratio is 3: 1 and the genotypic ratio is 1: 2: 1 for the inheritance of traits for one contrasting character, i.e., monohybrid cross.

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