

Chapter 9

Heredity

Heredity: Heredity refers to the transfer of characters from one generation to the next generation.

Inherited Traits: Inherited traits are characteristics or features that are passed from parents to their offspring through genes. For example - presence of attached or free ear lobes in human beings.

Acquired Traits: Acquired traits are things an organism learns or gets from its surroundings during its life. These traits don't get passed on to their offsprings

For example, if a person develops strong muscles through regular exercise, the acquired trait is the muscular strength. However, this acquired trait won't be inherited by their children. Inherited traits, on the other hand, are traits that are passed down from parents to their offspring through genes.

Rules for the Inheritance of Traits – Mendel's Contributions

Gregor Johann Mendel performed experiments with garden peas (*Pisum sativum*) to determine rules for inheritance of traits.

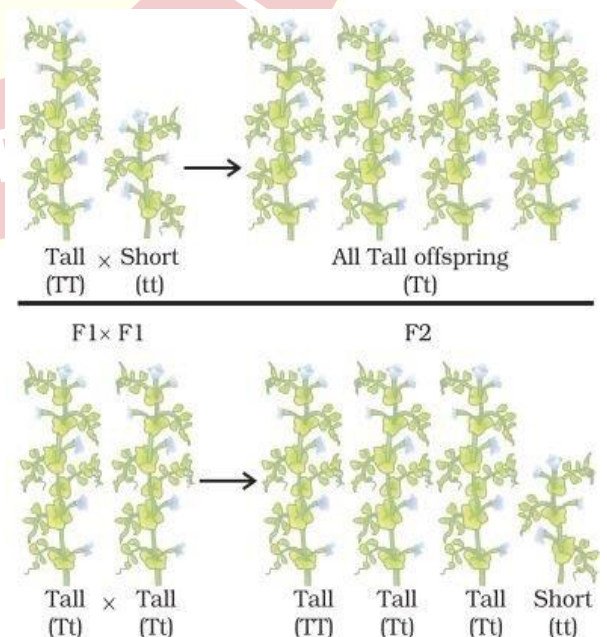
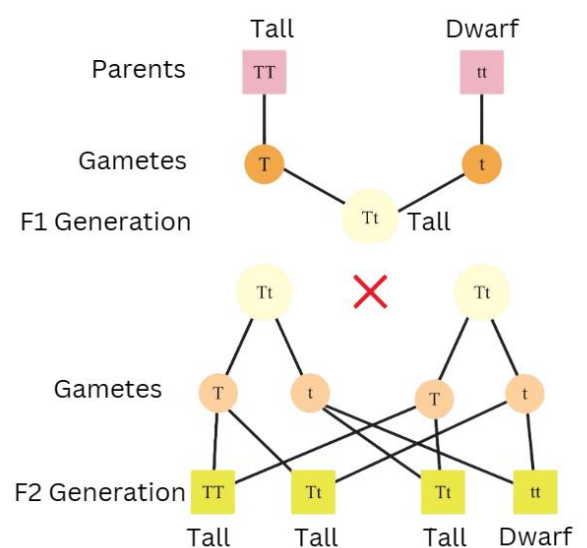
Mendel selected pea plants because:

- They are easy to cultivate.
- Their life cycle is quite short.
- The flowers of the pea plant are bisexual. Besides performing self-pollination, these plants can undergo cross-pollination if it is performed on them.
- Their characteristics can be distinguished properly without any difficulty.

Monohybrid Cross

Cross between two pea plants with one pair of contrasting characters is called a monohybrid cross.

Mendel took two types of pea plants – a tall plant and a short plant, produced progeny from them, and calculated the percentages of tall or short progeny.



- In first generation (F1), all plants were tall.
- In second generation (F2), one fourth of plants were short and others were tall.
- Both the tallness and dwarfness traits were inherited in the F1 plants, but only the tallness trait was expressed. Tallness is a **dominant trait** and dwarfness is a **recessive trait**.

Genotype: It refers to the genetic makeup of an individual. For example- a pure tall plant is represented by **TT**.

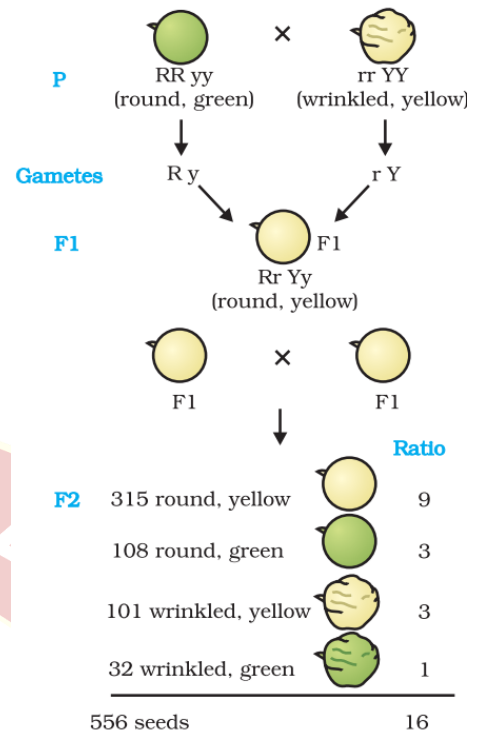
Phenotype: It refers to the physical appearance of the organism. For example - a plant having **Tt** combination will appear tall although it has gene for dwarfness.

Allele: Alleles are different forms of one gene. For example, in the pea plant, tall(T) and dwarf(t) are the two different traits for plant height.

Dihybrid Cross

Cross between two pea plants with two pairs of different characters is called a **dihybrid cross**.

Mendel crossed between pea plants bearing round green seeds and pea plants bearing wrinkled and yellow seeds.

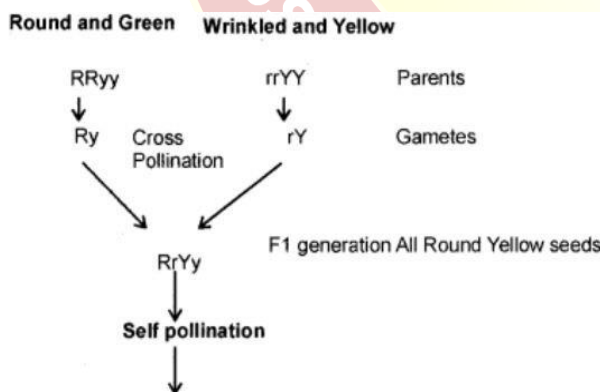


- In F1 generation, all plants had round and yellow seeds. Thus, round and yellow are dominant traits and wrinkled and green are recessive traits.
- In F2 generation, four different types of seeds were obtained. They were - round yellow, round green, wrinkled yellow and wrinkled green in the ratio of 9 : 3 : 3 : 1.
- Occurrence of new phenotype combinations shows that traits are independently inherited.

Sex determination

The process of determining the sex of an offspring is called sex determination.

- Different species use very different strategies for sex determination.
- In some animals, the temperature at which fertilised eggs are kept determines whether the animals developing in the eggs will be male or female.
- In some other animals, such as snails, individuals can change sex, indicating that sex is not genetically determined.



Gametes	RY	Ry	rY	ry
RY	RRYY	RRYy	RrYY	RrYy
Ry	RRYy	RRyy	RrYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
ry	RrYy	Rryy	rrYy	rryy

- In humans, the sex of the individual is genetically determined.
- In human beings, females have a perfect pair both represented by XX while males have a mismatched pair with a normal-sized X and a short one Y represented as XY.
- Thus, an ovum always contains X chromosome.
- An ovum, upon fusion with a sperm containing Y chromosome gives rise to a male child and upon fusion with a sperm containing X chromosome gives rise to a girl child.

