

GENETICS

This is the branch of Biology dealing with inheritance.

MENDEL AND GENETICS

Mendel is now considered to be the father of modern Genetics. He is best remembered for his study of characters in the garden pea (*Pisum sativum*). The characters he studied included (a) height (Tallness and shortness). (b) Colour of unripe pods (some were green others yellow). (c) Seed coat form (smooth coat and wrinkled coat). Mendel studied to find out by experiment how each of these characters was passed on from the parents to the offspring. He was successful in his work because he studied one character at a time and used a large number of samples.

The inheritance of one character with 2 contrasting traits is known as Monohybrid inheritance. Monohybrid inheritance is from Mendel's first law. The law of segregation. This law states that genes occur in pairs in normal body cells/somatic cells and when gametes are being formed then each gene of a pair separates from the other to go into its own gamete.

MENDEL'S METHOD

(a) For each character he studied, he first cross pollinated pure breeding plants with contrasting characters i.e tall plants he cross pollinated with short plants.

(b) He obtained seeds from these parental plants and planted them and when the seeds germinated, the plants that developed from those seeds were the first filial (F1) generation. Then he took records of how the character he was studying was expressed.

(c) Mendel selfed the F1 plants then obtained seeds from the F1 plants and planted them to get the 2nd filial generation plants. Again he observed how the character he was studying was expressed.

MENDEL'S RESULTS

From his work, Mendel made three observations.

- (i) That whenever plants with two contrasting characters were crossed, only one of the two characters expressed itself in the F1 like when tall plants were crossed with short plants, in the F1 all plants were tall.
The character that expresses itself in the F1 generation when two contrasting characters are considered is said to be DOMINANT. The one that fails to express itself is said to be RECESSIVE.

(ii) Mendel also observed that in the F2 generation, both contrasting characters were able to express themselves.

(iii) Mendel counted the plants in the F2 generation both for each experiment; he noted that the number of plants with the dominant character compared to those with the that recessive

character was always in the ratio of 3:1 i.e plants with the dominant character formed $\frac{3}{4}$ of the total number while the recessive formed $\frac{1}{4}$ of the total number. The 3 : 1 ratio is always obtained whenever monohybrid inheritance takes place.

Explanation of Mendel's results

Mendel's results are explained if it is assumed that each character studied is controlled by a pair of genes. This is because genes always occur in pairs in homologous chromosomes. In Genetics the genes are represented by letters of the English alphabet chosen for convenience. For a pair of genes the same letter is used. The dominant gene is represented by a capital letter while the recessive gene is represented by a small letter. For example for tallness and shortness the letters would be T for tallness and t for shortness respectively.

Terms used in genetics

a) Alleles: this is a pair of genes found at the same position on the homologous chromosomes. These are capable of affecting one given character. The two genes in a pair may be identical e.g TT,tt or different from each other for example Tt

b) Homozygous :this when the a pair of alleles are identical e.g TT,tt.TT is said to be homozygous dominant while tt is homozygous recessive.An organism having homozygous genes for a given character is said to be homozygous for that character like the one with TT is homozygous tall while tt is homozygous short

c) Heterozygous: this when a pair of alleles are different/not identical e.g Tt.

d)Phenotype:This is the physical appearance of an organism expressed in clearly observable characters irrespective of its genetic make up.e.g tallness

e)Genotype:This is the genetic make up of the organism.e.g Tt