

Genetics

The process of transfer of hereditary character from one generation to next generation is called Genetics. Johan Mendel is known as father of genetics. Mendel's experiments were based on cross breeding of two pea plants having contrasting characters for same feature i.e. tall and dwarf character of plant are for height of plant. He extended his work by two or three pairs of contrasting characters called dihybrid and trihybrid cross. He concluded some results on the basis of his experiment called Mendel's law.

1. Law of paired unit : Mendel proposed that when two dissimilar unit factors are present in an individual only one is able to express. One that expresses itself is dominant unit factor while other which fails to express is recessive unit factor. For example tallness is dominant over dwarfness.

2. Law of dominance : Offspring of cross breed parents only show dominant characters in F₁ generation.

3. Law of segregation : In F₂ generation both the characters which are governed by a gene are separated.

4. Law of independent assortment : During dihybrid and trihybrid cross two or three pairs of characters are taken. These characters segregate separately without depending on others in F₂ generation.

Terms related to genetics :

1. Linkage : Linkage is an exception of Mendel's law. When two different genes are present on the same chromosome their effects take place together instead of independently. This phenomenon is known as Linkage. The word linkage was first coined by Morgan.

2. Mutation : A sudden change in the gene which is heritable from one generation to another. The term Mutation was first coined by Hugo de Vries.

3. Variation : When characters are transmitted from one generation to next generation there is some change. Change in characters by recombination of genes in offspring takes place they look different from their parents. This phenomenon is known as Variation.

4. Chromosomal aberrations : Any change in chromosomal structure is known as Chromosomal aberrations.

5. Cloning : It is a process of producing many identical organism from a single cell having same genetic character as his mother. Ex : Sheep Dolly was produced from single cell.

6. Totipotency : It is the potential ability of a plant cell to grow into a complete plant.

7. Pluriopotency : It is the potential ability of a cell to develop any kind of the cell of animal body.

8. Genetically modified organism (GMO) : Manipulation of gene by cutting or joining the segment of DNA to get desired varieties of organism is called genetically modified organism. This is also known as genetic engineering.

9. Autosomes : Chromosomes found in cell which are responsible for characters other than sex are called autosomes.

10. Sex Chromosome : The pair of chromosome which determine the sex of organism is called sex-chromosome. Human have 23 pair of chromosome in which 22 pair are autosome and 1 pair is sex chromosome.

11. Genome : All gene present in a haploid cell is called genome.

Sex Determination in Human

In human male sex chromosome is 'XY', where as in female sex chromosome is XX. During gamete formation in male half of the sperm contain 'X' chromosome while other half contain 'Y' Chromosome. In female all gametes contain only one type of chromosome that is 'X'. Thus when a male gamete i.e. sperm carrying 'X' chromosome fertilize an ova, the zygote develop into female. When a sperm carrying 'Y' chromosome fertilizes an egg, zygote develops into male.

Sometime sex determination is regulated by environmental factor. In some reptiles temperature determine the sex at which the fertilized egg is incubated.

In human each cell contains 46 chromosomes. Any addition or removal in the number of sex chromosome or autosome cause genetic disorder.

1. Klinefelter Syndrome : When a male have anextra X or Y chromosome in sex chromosome then the condition will be XXY or XYY instead of XY. The individual with this syndrome have masculine development but feminine development is not completely suppressed and the individual became sterile.

In female when extra X chromosome is present instead of XX they show normal development but limited fertility. Mental retardness is also seen in this type of syndrome. Number of chromosome became 47 instead of 46.

2. Turner's Syndrome : When female has single sex chromosome (X0) their ovaries are rudimentary, lack of secondary sexual character.

3. Down's Syndrome : When an extra chromosome is added to 21st autosomal chromosomes this lead to develop Down's syndrome. In this syndrome person became Mangolism. The person is mentally retarded, eyes protruded an irregular physical structure is present.

4. Patau's Syndrome : This type of syndrome is develop by an addition of autosomal chromosome in 13th chromosome. There is a cut mark in the lip and person is mentally retarded. Disease due to change in gentical constituent of chromosome.

1. Sickle Cell Anaemia : In this disorder erythrocytes destroyed more rapidly than normal leading to anaemia. These occur due to change in 11th autosomal chromosome.

2. Phenylketonuria : It is an inborn error of metabolism which result in mental retardation cause due to change in 12th autosomal chromosomes.

3. Haemophilia : Gene responsible for this disorder is linked with sex chromosomes. This disease lead to failure of blood clotting.

4. Colour blindness : This disorder lead to failure to distinugished red & green colour. The gene responsible for this disease is situated on sex chromosomes.