MUTATIONS

- The sudden changes in the genetic material of the organisms causing phenotypic alterations of characters that are carried to next generation are called mutations of discontinuous variations.
- Mutations were noticed by Hugo de Vries in the plant Oenothera lamarckiana (lamarck's evening primerose).
- The results of his observations were published in 1901 in his volume " Die Mutation Theorie"
- The organism which has undergone a mutation is called a mutant.
- Mutations have been identified as one of the bassis for biological evolution since they generate large amount of variability in a population.

According to their origin, mutations are classified into two types.

A. Spontaneous mutations, B. Induced mutations

A. Spontaneous mutations:

- They occur naturally and suddenly.
- The frequencies of these mutations are very less and are rare in occurrence.
- They can be noticed one in ten lakh individuals. So they are difficult to be detected.

Eg: 1. Bhaskara' Banana variety

2. Delicious' Apple variety

3. GEB – 24' Rice variety

4. 'Navel' Orange variety

B) Induced mutations:

- They are caused by external factors. So they are called artificial mutations.
- The agents which lnduce them are called Mutagens.
- They are widely used in the improvement of crop varieties.
- Mutagens are of two types

I. Physical mutatgens: physical agents such as X-rays, β-rays, γ-rays, neutrons, UV rays are physical mutagens.

II. Chemical mutagens: Compounds such as colchicines, malice hydrazide, diethyl sulphate (DES), ethyl methane sulphonate (EMS), nitrous acid, formaldehyde etc. are called chemical mutagens.

The above mutations are resulted due to the changes in chromosomes or genes as mentioned below:

I. Chromosomal mutations: Any change in the number or structure of chromosomes is called chromosomal mutation. They are of two types.

I. Structural Changes: During prophase I of meiosis, homologous regions of chromosomes show many changes in structure in order to form pairs or bivalents. These structural changes are of 4 types. They are:

a. Deletions: A part of chromosome is broken and lost.
b. Duplications: A particular part of chromosome is repeated.
c. Inversions: a broken part of chromosome reattached to the original chromosome in reverse order.
d. Translocations: A broken segment of chromosome is attached to a non homologous chromosome.

ii. Numerical Changes: These are of two types:

a. Euploidy: Genomes containing chromosomes which are multiple of some basic number. Eg. Monoploids (x) (one genome), Dipoids (2x)(two genomes), Triploids(3x) (three genomes), Polyploids (αx) (many genomes)
b. Aneuploidy: {presence oif one or two chromosomes extra or less over the normal chromosome number Eg: Monosomy (2n-1), Trisomy (2n+1), Nullisomy (2n-2), Tetrasomy (2n+2).

II. Gene mutation or point mutation: It occurs in a very small segment of DNA molecule i.e. a single nucleotide or a nucleotide pair.

Significance of mutations

- Mutations generate a large amount of variability in a population hence improved varieties of crop plants with several desirable characters can be obtained after careful selection and hybridization.