

# Mutation

(1)

Sudden inheritable changes which altering the phenotype of an individual is known as Mutation [Hugo de Vries].

Now a days mutation covers only those changes which alter the chemical structure of gene at molecular level.

- (x) Both chromosomal and genic mutation can show the similar phenotypic effect but they can be differentiated after seeing the chromosome. The other difference is that genic mutation can be revert back to original (wild type) where as chromosomal mutation cannot.

(1751) Seth Wright was first to find a short legged lamb in a herd of long legged sheep, and developed a line of short legged sheep called as Horn. (This character is due to recessive gene and individuals are homozygous for it.)

T. H. Morgan (1910) found a <sup>white</sup> ~~red~~ eye male in a Red eyed flock and produced a line of ~~red~~ and white eyed male and female flies.

Then in maize, snapdragon, pea, rodents, fowls man etc. It is recent to be reported in microorganisms, like Bacteria, Neurospora, Aspergillus and bacteriophage. They are very suitable.

- (x) Mutation may occur ~~at~~ —
- at any stage,
  - in somatic as well as germinal cells
  - spontaneously,
  - naturally as well as induced,
  - Harmful or useful,
  - large or small
  - recessive and rare
  - lethal.

There are different types of mutations on different basis

- (A) Stages at which mutation can occur →
  - a) Pre-gametic, b) Gametic or zygotic c) Post zygotic
- (B) Type of cells → (a) Somatic (b) Generative.
- (C) Origin → (a) Natural or Spontaneous, (b) Induced.
- (D) Direction → (a) Forward, (b) Backward.
- (E) Magnitude at Phenotypic level → (a) Dominant, (b) Recessive.
- (F) Type of Chromosome → (a) Autosomal  
(b) Allosomal or Sex-chromosomal.
- (G) Size or Quantity (a) Gross or Chromosomal  
(b) Point or Genic.

Artificial mutation can be induced by different agents which are known as Mutagenic agents or the simply Mutagens. They are also of different ~~be~~ as follows:-

- (H) Physical → They are physical quantities →
  - a) Radiation. It is of two types →
    - (i) Ionizing → They are ionised particles e.g.  $\alpha$ ,  $\beta$ ,  $\gamma$ , & X-Rays.
    - (ii) Non-Ionising → They are nonionised i.e. without any charge → Neutron, Visible light, U-V rays (Ultra-Violet Rays).
  - b) Temperature → Thermionic shocks Sudden warming, or cooling i.e.  $10^{\circ}\text{C}$  rise in temperature increases the chances 2-3 times.

(B) Chemicals :- Only those chemicals which can enter the nucleus of the cell. e.g. Nitrous Acid ( $\text{HNO}_2$ ), Ethyl Methane Sulphonate (EMS), Methyl Methane Sulphonate (MMS), Dimethyl Diethyl Sulphonate (DDS), Magnesium Chloride ( $\text{MgCl}_2$ ); Caffein, Acridine etc. Hydroxyl amine (HX); Hydrazine etc.

Role of Mutation → It is a cause of origin of new species, varieties and species of both. Some of the mutant varieties are as follows:

Wheat → Sharbati Sonara, NP-836 Pusa Lerma	Rice → Reimei, Japonica Jaganath	Borly → RDB-1	Caster → Asuna.
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QHP

Gross Mutation or Chromosomal Mutation → The change in chromosome number or structure is known as Chromosomal mutation ⇒ It is of two types

(A) Ploidy → It is change in number of Chromosome. The ploidy is of two types (i) Euploidy and (ii) Aneuploidy.

(i) Euploidy :- In every organism there is a set of chromosome known as Genome. Its one set is known as Monoploidy. In euploidy there is increase in complete set of Chromosome. It is of two types

(a) Autopolyploidy & Autopolyploidy

(b) Allopolyploidy

(c) Segmental Allopolyploid.

(a) Autopolyploidy → Here the entire sets of genome are identical. It is caused due to absence of spindle fibre. It may be of following types

Triploid → AAA

Tetraploid → AAAA

Pentaploid → AAAAA

Hexaploid → AAAAAA

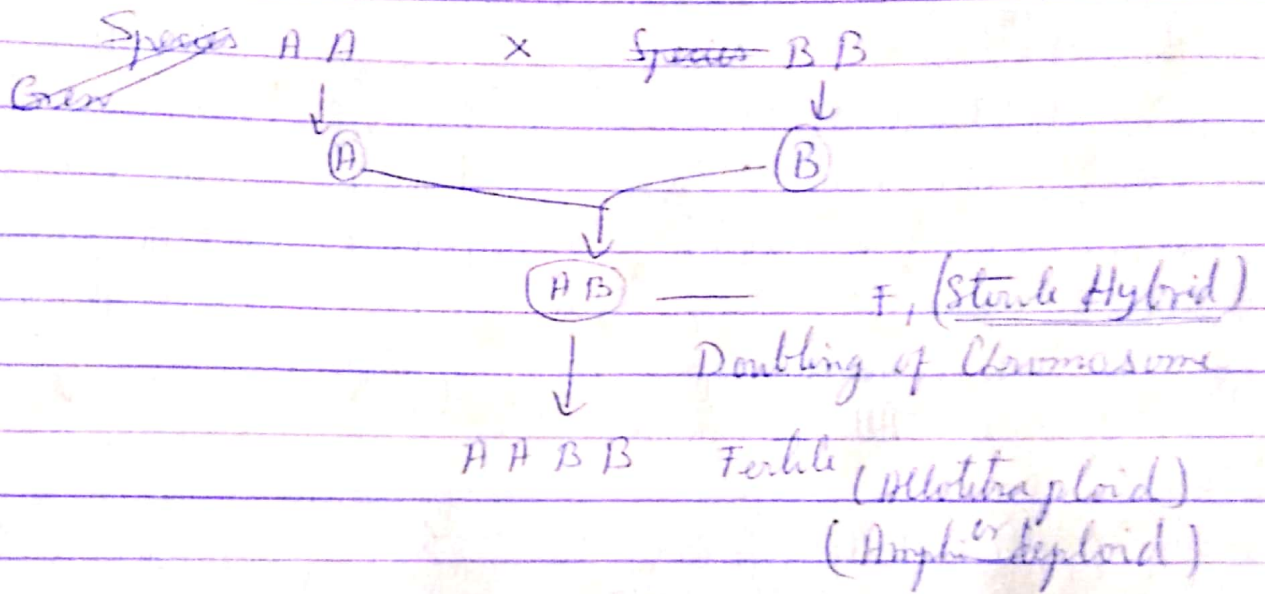
eg are → Banana, Grapes, Watermelon etc

Characteristics →

1. Large in size, plant, stem, fruit, pollen seed etc.

2. Delayed growth and flowering, B.S. High sterility etc.

(b) Allopolyploidy  $\rightarrow$  Allopolyploidy: - Here there is different sets of genome which comes from two different varieties, genera or species followed by doubling of chromosome as:



It helps in combining the desired characters of from different plant species in one. e.g.

1) Raphanobrassica.

