

Points to Remember

Breeding

- ✱ **Plant breeding** : Introduction of new varieties of plants, selection, polyploidy, breeding, mutation breeding and hybridization.
- ✱ **Animal breeding** : It involves mating parents of different varieties each having some desired trait which are passed onto the offspring.

Plant breeding

Plant diseases are caused by pathogens like viruses, bacteria and fungi.

For high yield and better quality :

- *Sonalika, Kalyan sona* – Semi-dwarf wheat (Origin : Mexico)
- *IR – 8* (miracle rice) – *Peta* (Indonesia) + *Dee-geo-woo-gen*(China)

For disease resistance :

Crop	Variety	Resistance to diseases
Wheat	<i>Himgiri</i>	Leaf and stipe rust, hill bunt
Cauliflower	<i>Pusa Shubhra, Pusa Snowball K-1</i>	Black rot
Cowpea	<i>Pusa Komal</i>	Bacterial blight

For Insects or pests resistance :

Crop	Variety	Resistant to Insects / Pests
Brassica	<i>Pusa Gaurav</i>	Aphids
Flat Bean	<i>Pusa Sem 2, Pusa Sem 3</i>	Leaf hopper, aphids and fruit borer
Lady's finger	<i>Pusa Sawani, Pusa A4</i>	Shoot and fruit borer

For improved nutritional quality (protein, oil, mineral) :

Biofortification : Developing crop plants enriched with high levels of desirable nutrients

- *Protina, Shakti and Rathna* - lysine rich maize hybrids
- *Atlas 66* - protein rich Wheat

Methods of plant breeding

(to develop high yielding varieties)

- 1. Introduction of new varieties of plants** : The process of introducing high yielding plants varieties from one place to another. *Ex* : *Phaseolus mungo, China*.
- 2. Selection** : Plants are sorted from a mixed population based on morphological characters.
 - i) Mass selection** : Best plant seeds of desired characters are collected and raised for seven or eight generations. *Ex* : TMV-2, AK-10
 - ii) Pureline selection**: It is the progeny of a single individual obtained by self breeding.
 - iii) Clonal selection** :It is the selection of desirable clones from the mixed population of vegetatively propagated crop.
- 3. Polyploidy breeding** : Polyploidy (having more than two sets of chromosomes) is induced by physical agents to achieve desire character. *Ex* : Seedless watermelon (3n)
- 4. Mutation breeding** : Process by which genetic variations are created to bring changes. *Ex* : Sharbati sonara, Atomita 2 rice
 - **Mutation**: Sudden heritable change in DNA nucleotide sequence.
 - **Mutant** : Organism which undergoes it.
 - **Mutagens (or) Mutagenic agents** : Physical or chemical factors which induce it.
- 5. Hybridization** : It is the crossing of two or more type of plants to bring desired character together. *Ex* : *Triticale*

Animal breeding	<p>Objective : To improve the genotypes of domestic animals to increase their yield.</p> <p>Inbreeding : Breeding between animals of same breed for 4-6 generations. Ex : <i>Hissardale</i></p> <p>Outbreeding : Breeding of unrelated animals. Ex : <i>Mule</i></p> <p>Heterosis (or) Hybrid vigour: It is the superiority of hybrid obtained by cross breeding.</p>
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Genetic Engineering (or) Recombinant DNA technology

It is the manipulation and transfer of genes from one organism to another to create a new DNA.

Important discoveries : Plasmid, Restriction enzymes, DNA ligases.

Gene cloning	It is a process to make a genetically exact copy of an organism.
Gene therapy	<p>The replacement of defective gene by the direct transfer of functional genes into humans to treat genetic disease or disorder. Types :</p> <ul style="list-style-type: none"> * Somatic gene therapy : It is the replacement of defective gene in somatic cells. * Germ line gene therapy : It is the replacement of defective gene in germ(egg / sperm) cells.
Stem cells	<p>They undifferentiated or unspecialised mass of cells. Types of stem cells :</p> <ul style="list-style-type: none"> * Embryonic stem cells : They can be extracted and cultured from early embryos. * Adult stem cell / somatic stem cell : They are found in the neonatal and adults. <p>Uses : <i>Stem-cell therapy</i> - used to replace the damaged cell tissues or organs.</p>
DNA finger printing	<p>It is an easy and quick method to compare genetic difference among two individuals.</p> <ul style="list-style-type: none"> * VNTR – Molecular markers for identification. * Satellite DNA – 1% differing DNA that repeats.
Genetically modified organisms	<p>Transgene : Inserted DNA fragment Trangenic organisms : Plants or animals having transgene</p> <p>Ex : Plants - Golden rice (Beta carotene gene), Insect resistant plants (Bt gene)</p> <p style="padding-left: 40px;">Animals – Transgenic sheep (improved wool quality), Fish (increased growth)</p>

Cross between	Breed	Speciality
Bikaneri ewes × Australian marino rams	<i>Hissardale</i>	Inbreed
Male donkey × Female horse	<i>Mule</i>	Strong, intelligent, ability to work, resistant to disease
White leghorn × Plymouth rock	<i>Fowl</i>	Yield more eggs
Brown swiss × Sahiwal	<i>Karan swiss</i>	Yield two to three times more milk than indigenous cow