Vegetative Propagation and Micropropagation

- There are two principles to improve the quality and quantity of products.
  By growing the desired variety of plants in large numbers
  1. Vegetative propagation
     - Natural vegetative propagation
     - Artificial vegetative propagation
  2. Micropropagation

  By evolving new varieties of plants with desired characteristics
  1. Hybridisation
     - Cross pollination
     - Somatic cell hybridisation

- **Vegetative propagation** or **vegetative reproduction** is a form of asexual reproduction in which a relatively large, differentiated part of the plant's body gets detached from the parent plant and develops into an independent plant.

- **Differences between Sexual Reproduction and Vegetative Propagation**

SEXUAL REPRODUCTION	VEGETATIVE PROPAGATION
• Slow, uncertain and less economical method.	• Quicker, more certain and less expensive method.
• Seeds are viable and strong enough to face the environmental changes.	• Seeds are less viable and less strong.
• Seedless plants cannot be reproduced by this method.	• Seedless plants can be reproduced by this method.
• Parental characteristics are not retained and get mixed up.	• Genetic characteristics are retained.
• New varieties are possible.	• No new varieties can be produced.
• Overcrowding does not take place due to dispersal of fruits and seeds.	• Overcrowding occurs as there is no dispersal of fruits and seeds.

- **Natural Vegetative Propagation**

PROPAGULES	DESCRIPTION	EXAMPLES
Rhizome	• Underground, horizontal, branching stem.	Ginger, turmeric etc.
Stem tuber	• Swollen tip of underground, lateral stem.	Potato, artichoke etc.
Corm	• Short, vertical, underground stem, swollen with reserved food.	Crocus, gladiolus etc.
Bulb	• Underground, lateral branches. • Their ends turn up and produce buds.	Mint, pear, banana etc.
Runners	• Grow rapidly along the ground, producing buds and adventitious roots at intervals. These become separate plants.	Strawberry, creeping grass, *Desmodium* etc.
Offsets	• Short stout runners terminated by a single bud.	Houseleek (*Pistia*), *Eichhornia* etc.

Stolon	• When a weak stem falls over and touches the ground, its tip swells. It develops adventitious roots and the further growth is continued by a lateral bud.	Blackberry, fern etc.
Root tubers	• Swollen fibrous roots, each capable of developing into a new plant.	*Dahlia*, sweet potato etc.
Leaf buds	• Bud detaches and grows into a new plant.	*Dahlia*, sweet potato etc.
Bulbils	• Detachable buds	Yam *etc.*

- **Artificial Vegetative Propagation**

METHOD	EXAMPLES
Cutting is removing a portion of the stem and fixing it into the soil to allow the growth of roots and shoots.	Stem cutting: Rose, *Bougainvillea*, **etc.** Root cutting: Lemon, tamarind etc.
Grafting is joining a part (stem or bud) of a living plant to another, causing it to grow as a part of another plant. **Types of grafting** Approach grafting Cleft grafting Tongue grafting/whip grafting Bud grafting	Sapota, mango, guava, apple, orange, peach, rose etc.
Layering is a method in which a branch of the plant is covered with some material and supplied with water to produce roots. **Types of layering** Air/aerial layering Ground/mound layering	*Hibiscus*, jasmine, rose, *Bougainvillea* etc.

- **Micropropagation** is the technique of production of new plants from cells or tiny pieces of plant tissues that are removed from the growing tips of a plant and put into a suitable growth medium called the culture solution to produce callus, which gets differentiated into a plantlet.

- **Hybridisation** is mixing up of the characters of two parents in the new offspring.
  a. **Intraspecific hybridisation:** Hybridisation between two varieties of the same species.
  b. **Interspecific hybridisation:** Hybridisation between two different species.

- **Cross pollination** is the transfer of pollen grains from the anther of a flower of one plant to the stigma of a flower of another plant of the same species.

- **Emasculation** is the method of removing anthers to prevent self-pollination.

- **Somatic cell hybridisation** involves the fusion of somatic or body cells from two different varieties of a species or even from two different species.

- **Biotechnology** is the use of microorganisms or living cells in industry and technology to manufacture various types of foods, drugs, medicines and chemicals as well as to breakdown the wastes.

- Biotechnology is practised in two ways.
  a. **By making use of natural microorganisms:** Natural microorganisms are used for the manufacture of many food items, such as cheese, curd or yogurt, vinegar, cake, bread, *idli*, *dosa* etc. These are produced by the action of microorganisms based on the principle of fermentation.
  b. **By using genetically engineered microorganisms:** Genetically engineered microorganisms are used for the large-scale production of useful products such as insulin etc. or in gene therapy.

- **Applications of Biotechnology**

Production of cheese	Production of yoghurt	Production of alcoholic beverages	Production of vinegar
Production of vitamins	Production of enzymes	Genetic engineering	Transgenic organisms
Proteomics	Forensics	Biochips	Biosensors