CHAPTER 15
REPRODUCTION

NOTES

- **Reproduction** is the biological process by which living organisms produced new individuals similar to themselves. Reproduction is not a life process but to maintain the continuity of their own race (or species).

TYPES OF REPRODUCTION:

Asexual and **Sexual reproduction**

- **Asexual reproduction** is a rapid method of reproduction by a single parent without the formation and fusion of two cells or gametes.
- All the offspring are genetically identical and known as **clone**.
- **Sexual reproduction** is a slower method of reproduction by two parents (male and female) involving the formation and union of gametes.
- All the offspring are not genetically identical and show variations.

REPRODUCTION IN PLANTS

- **Types of Asexual reproduction in plants:** **Budding, fragmentation, sporulation (spore formation), vegetative propagation, parthenogenesis and tissue culture.**

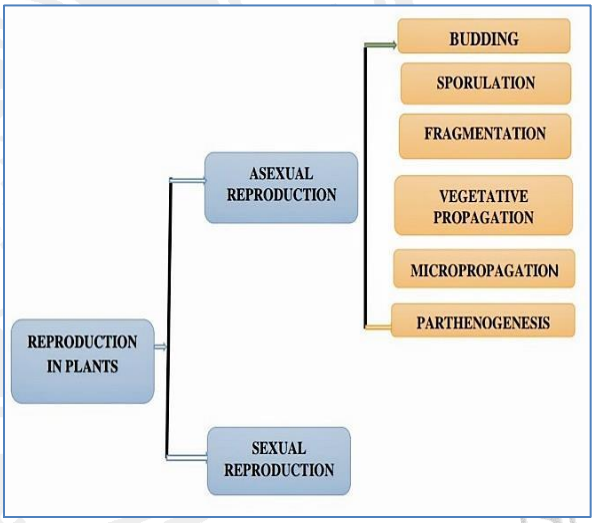


Fig. Types of Asexual reproduction in plants

- **Budding** is an asexual method of reproduction with **bud** which develops as an outgrowth due to repeated cell division at a specific site e.g. *Yeast*

  Fig: Budding in Yeast.

- **Fragmentation** is an asexual method of reproduction in which the parent breaks into daughter fragments e.g. *Spirogyra*
- **Sporulation or spore formation:** Asexual method of reproduction by means of small reproductive units called **spores**.

  Spores are small bodies containing a nucleus, a small amount of cytoplasm and surrounded by thick protective wall that get easily dispersed by wind e.g. Liverworts, mosses, ferns, etc.

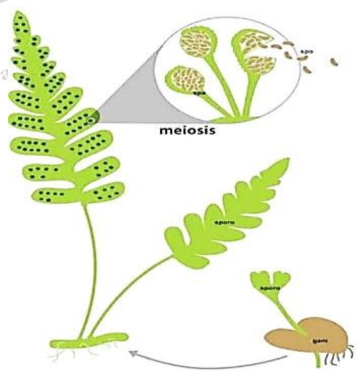


Fig. Sporulation in Fern

Vegetative propagation: Asexual reproduction with the help of vegetative parts of plants such as roots, stems, leaves, buds, etc. is known as **vegetative reproduction.** e.g. sweet potato, onion, grasses, banana.

- It is used in artificial methods of propagation such as layering, grafting, cutting and artificial culture in different media.

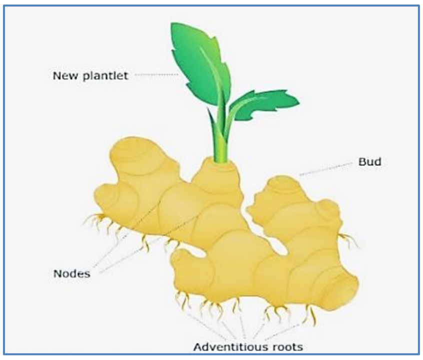


Fig. Vegetative Propagation

- **Micropropagation (or Tissue culture)**

  The technique of raising plants vegetatively by culturing cells, tissues or organs on a sterilized nutrient medium under ***in vitro*** condition is called micropropagation.

- **Parthenogenesis**

  It is a type of asexual reproduction involving the development of female gametes **without any fertilization.**

- It is the process of development of new individual from unfertilized ovum or egg.
- It is derived from the Greek words for "virgin birth".
- It may be natural or artificial e.g. *Chara*, Tomato, etc.

SEXUAL REPRODUCTION (PLANTS)

- In lower plants, it occurs by the process of conjugation ***(Spirogyra)*** and gametangial contact ***(Mucor)*.**
- In mosses and ferns, male and female gametes are formed inside antheridium and archegonium respectively. Zygote is formed by union of gametes which undergoes reduction division to form spores.
- In gymnosperms, seeds are formed within the cones and inside the fruit in angiosperms.

  Flower is the reproductive structure of a flowering plant. It has four sets of floral parts.

- **Calyx:** collection of sepals.
- **Corolla:** collection of brightly coloured petals.
- **Androecium:** male reproductive parts consisting of stamens (composed of filaments and anthers). It produces male gametes.

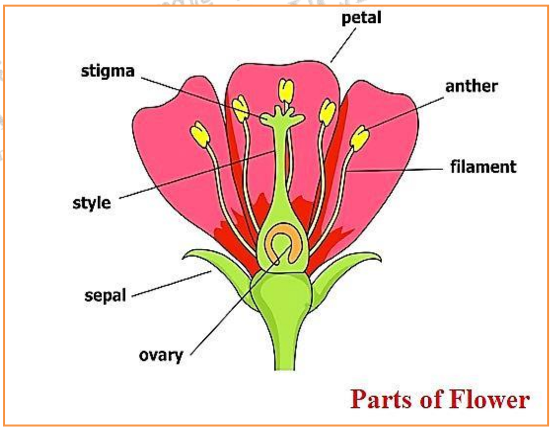


Fig. Parts of a Flower

- **Gynoecium:** female reproductive parts consisting of stigma style and swollen base ovary.
- Flower may be **bisexual** (both androecium and gynoecium parts are present e.g. -Mustard, Pea, etc.) or **unisexual** (contain either androecium or gynoecium e.g.-Papaya, Watermelon, etc.)

Pollination

- It is the transfer of pollen grains from anther to stigma of same (**self-pollination**) or different flower (**cross pollination)**. It is carried out by the agencies of wind, water, insects, etc.
- **Cross pollination** (artificial pollination) is widely used in production of hybrids.

Fertilization is the fusion of the male and female gametes and its product is **zygote.**

Seed is a fertilized ovule containing a protective seed coat, food and an embryo.

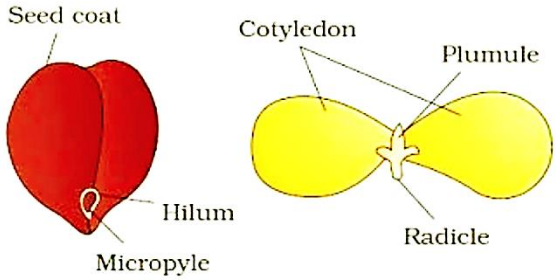


Fig: Parts of a Seed

- The parts of seed are **seed coat, embryo, endosperm and hilum.**

Types of seed:

DIFFERENCES	
ENDOSPERMIC SEED	**NON-ENDOSPERMIC SEED**
1. Endosperm is present in mature seeds. **2.** Food is stored in the nutritive tissue.	**1.** The endosperm is absent in mature seeds. **2.** Food is stored in cotyledons.

Monocots have single cotyledon e.g. Rice, wheat, Maize, etc. whereas **Dicots** have two cotyledons e.g. Pea, beans, mustard, etc.

Germination: It is the growth of embryo to form seedling.

- Types of germination: **Hypogeal germination** and **Epigeal germination**

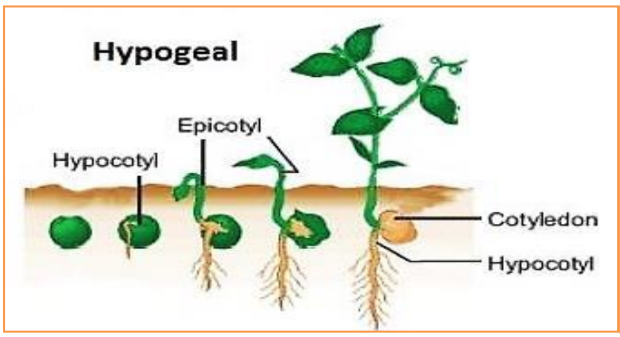


Fig. Hypogeal Germination

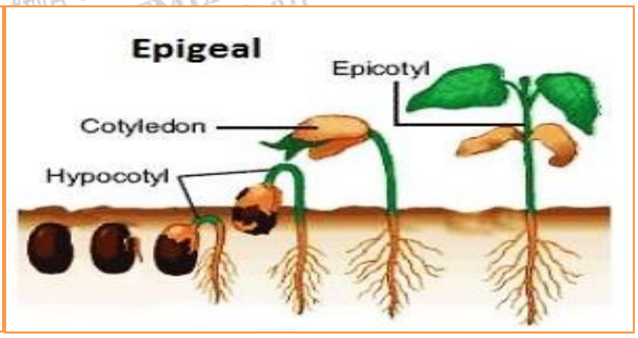
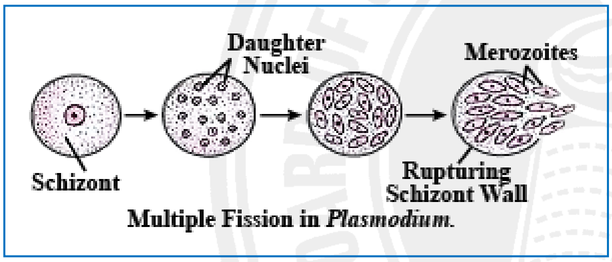


Fig. Epigeal Germination

Difference between Epigeal and Hypogeal germination:

DIFFERENCES	
HYPOGEAL GERMINATION	**EPIGEAL GERMINATION**
➢ The cotyledons remain below the ground and plumule emerges.	➢ The cotyledons emerge above the ground.
➢ This is due to the elongation of epicotyl.	➢ This is due to elongation of hypocotyl.
➢ The cotyledons do not act as leaf.	➢ The cotyledons act as embryonic leaf.
➢ e.g. Maize, Gram, Bean, etc.	➢ e.g. Castor, sunflower, etc.

Reproduction in animals: Asexual methods-**Binary fission, multiple fission, regeneration and budding**



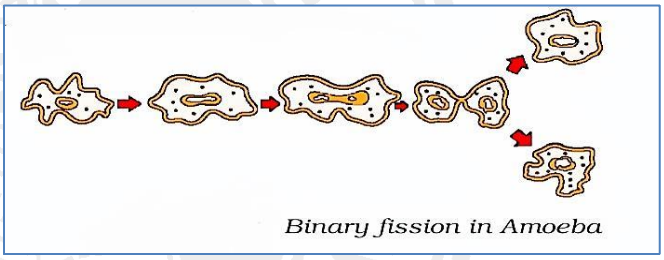
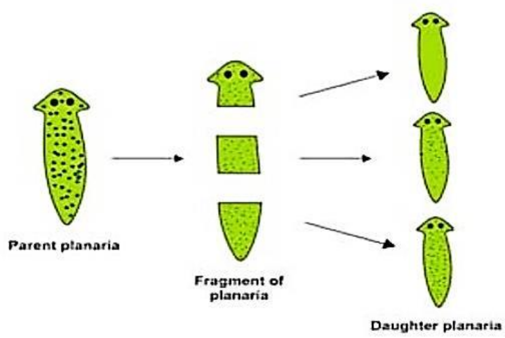


Fig. Multiple Fission in *Plasmodium* **Fig. Binary Fission in *Amoeba***

Fission: A single cell body is divided into two more daughter individuals found only in unicellular organism.

Regeneration: The process of development of new individuals from broken pieces which is carried out by special cells in which they divide to form a large number of cells ; different cells then give rise to various cell types and tissues and finally give rise to a complete individual.



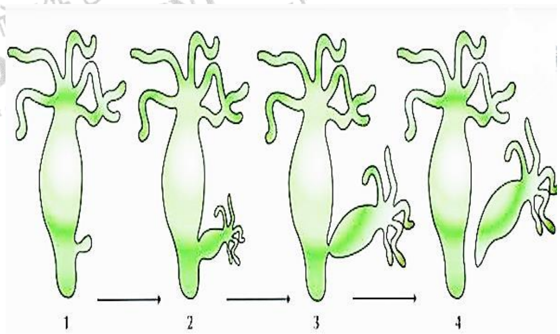


Fig. Regeneration in *Planaria* **Fig. Budding in *Hydra***

Budding is also found in animals like *Hydra* where special reparative cells develop an outgrowth called **bud** due to repeated cell division at a specific site. The bud grows in size and detached at maturity.

SEXUAL REPRODUCTION (INVERTEBRATES)

- **Through oral grooves**: In *Paramecium*, they meet by their oral grooves for exchange of cytoplasmic and nuclear materials. After separation each individual divides into two by binary fission.
- **Copulation**: In insects, both the partners are actively involved in the transfer of gametes by their physical union e.g. earthworms, insects.
- **Hermaphrodite animals:** In hermaphrodite animals like hydra and tapeworm, male and female gonads mature at different time to perform sexual reproduction.
- In earthworm, sperms are exchanged between two individuals by copulation to prevent them from self-fertilization.
- **Metamorphosis** is the transformation from larva to adult during the development of an organism e.g. seen in insects, amphibians, etc.
- **Sexual reproduction (Vertebrate animals)**

  The fusion of gametes occur by external release as in Fishes and Amphibians **(External fertilization)** or by internal transfer as in birds and mammals **(Internal fertilization)**
- **Viviparous:** Animals that gave birth to young ones and the development takes place inside uterus by placenta e.g. rat, rabbit, monkey and human beings.
- **Oviparous:** Animals that lay egg and development of embryo takes place inside it e.g. birds

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