

# CLASS – 12

# BIOLOGY

## Chapter – 1

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**PGT- Biology**

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### Life Span:

- Period from birth to natural death of an organism.
- Depend on disease, natural disasters, war, diet and habits.

**Question:** Individual of organism die at the end of its life span but how species continue to live from generation to generation?

### Reproduction:

- It is biological process in which organism give rise to their young one which may or may not similar to each other.
- Due to diversity of living organism they have adopted its own mechanism to multiply and produce offspring.
- There are mainly two types of reproduction found in organism-

I. *Asexual reproduction.*

II. *Sexual reproduction.*

- With the help of reproduction a species can

I. *Ensure continuity and preservation of them self.*

II. *Maintain their genetic identity due to asexual mode.*

III. *Keep evolutionary change by sexual mode.*

### Asexual Reproduction:

- Single parent involve.
- Gametes are not formed.
- Fertilization does not take place.
- Offspring are identical (*i.e. morphologically and genetically*) to parents.
- Common in Monera, Protozoa and lower invertebrates (*i.e. sponges, jellyfishes, flatworms and annelids*).

### Advantage:

- I. Short term process.
- II. No production of gametes (*i.e. fertilization absent*).
- III. Maintain genetic uniformity (*i.e. no variation*).

### Types of Asexual Reproduction:

1. Fission
2. Budding
3. Fragmentation
4. Regeneration
5. Spore formation
6. Vegetative propagation.

#### 1. Fission

- Cell or body divide into two or more parts and each part grow into whole new individual.
- It is mainly two types:

1. *Binary fission*

2. *Multiple fission*

### a) Binary fission:

- After replication genetic material (i.e. DNA) cell divide into two equal sizes of daughter cells.
- It occurs in following ways:

#### I. Longitudinal binary fission: (e.g. *Euglena*, *Trypanosoma*).

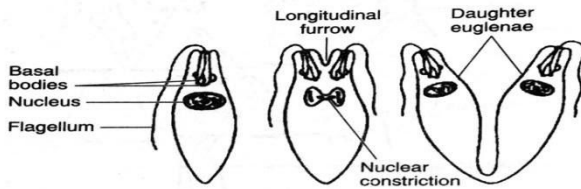


Fig. 1.3 Longitudinal Binary Fission in *Euglena*

#### II. Transverse binary fission: (e.g. *Paramecium*, *Planaria*, diatoms and bacteria).

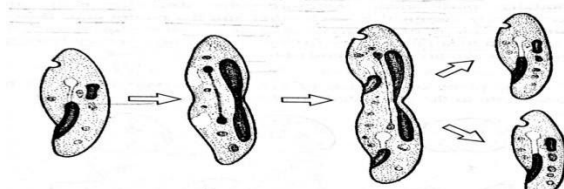


Fig. 1.4 Transverse Binary Fission in *Paramecium*

#### III. Oblique binary fission: (e.g. *dinoflagellates* i.e. *ceratium*).

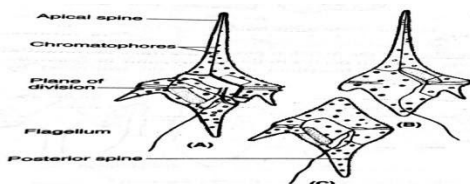


Fig. 1.5 Oblique Binary Fission in *Ceratium*

### b) Multiple fission:

- After replication of genetic material cell divide into more than two daughter cells.

Examples: *Plasmodium*, RBCs and oocytes of stomach wall of mosquito.

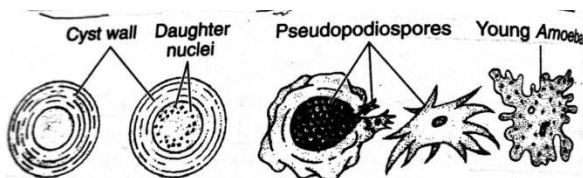


Fig. 1.7 Multiple Fission in *Amoeba*

## 3. Budding

- Bud (i.e. protuberance of proliferating cytoplasm or cells) develops into organism.

Example: *Bacteria*, *Yeast*, *Protozoan's*, *Sponges* and *Cnidarian*.

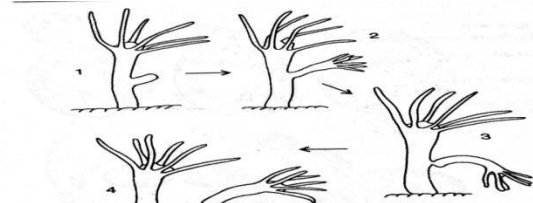


Fig. 1.10 Budding in *Hydra*

## 4. Fragmentation

- Occurs in multicellular or colonial organism.
- Organism split into many fragments which develop into mature individuals.

Example: *Filamentous cyanobacteria*, *Moulds*, *Lichens Plant* (i.e. gemma in liverwort) *Sponges*, *Flatworms*, *Annelids*, *Echinoderms*.

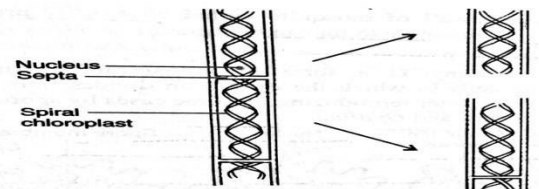


Fig. 1.12 Fragmentation in *Spirogyra*

## 5. Regeneration:

- Restoration of new growth by **organs/ tissue** which remove from organism and *develop into complete organism*.

Example: *Sponges*, *Hydra*, *Planaria*

- Spore formation
- New individual develop from spores.

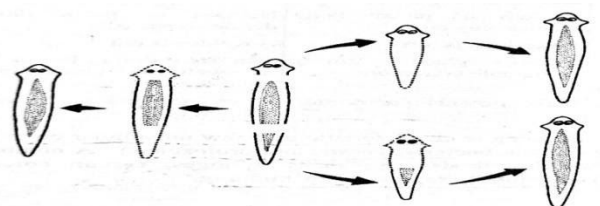


Fig. 1.13 Regeneration in *Planaria*

## Asexual reproduction by spore formation in fungi

- Fungi produce two type of asexual spores:
- 1. Sorangiospore

## 2. Conidia

### 1. Sporangiospore:

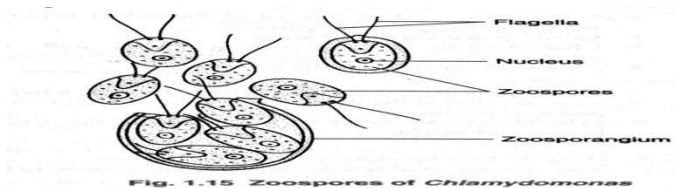
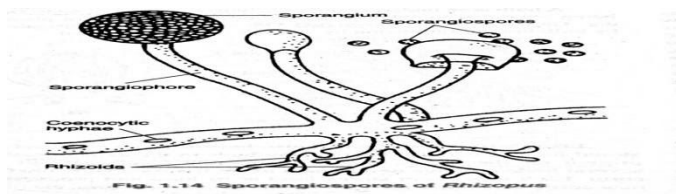
- Endogenous in nature (*i.e. formed and contain within in sporangium*).
- Formed due to cleavage of protoplasm around nuclei.

**Example:** Phycomycetes, Oomycetes, Hypochytriomycetes.

- Two type of sporangiospore are formed :

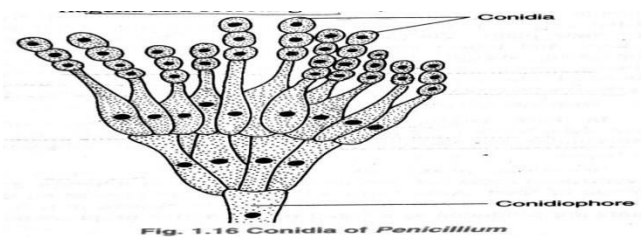
I. Zoospore (*i.e. motile*)

II. Aplanospores (*i.e. non-motile*)



## 2. Conidia:

- Exogenous in nature.
- It is characteristics of mitosporic fungi and Ascomycetes, Basidiomycetes.



## Vegetative Propagation:

- New plants grow from **vegetative parts** (*i.e. stem leave*) without flower, pollination and seeds.
- Vegetative parts known as **vegetative propagules**.

### Types of vegetative propagation:

1. Natural method

2. Artificial method

#### 1. Natural method of vegetative propagation:

- Vegetative propagules detached from parent body and develop into new plants under suitable condition.

**a. Root:** Example: *Dahlis, Sweet potato, guvava, shisham.*

#### **b. Underground stem:**

**Tuber:** *solanum tuberosum (potato)*

**Bulbs:** *Garlic, daffodil, onion*

**Corns:** *Colocasia, crocus, Freesia etc.*

**Rhizome:** *Banana, Ginger, Turmeric.*

**Suckers:** *Mint, Chrysanthemum.*

#### **c. Sub-aerial stems:**

**Runners:** Entire new plants develop from node located at interval in the runners.

Example: Lower grass, Centella.

**Stolons:** *Strawberry (Fragoria), Vallisneria*

Offsets: *Eichhornia (water hycinth), Pistia (water lettuce)*

**D. Aerial Stems:** *Opuntia, sugercane.*

**E. Leaves :** *Begonia, Bryophyllum.*

**F. Bulbils:** *Oxakis, Agava, Pineapple, Lily, Chlorophytum.*

### Artificial method of vegetative propagation:

#### 1. Cutting:

- Stem with some node and internodes placed in moist soil which give rise to adventitious roots and new plants.

**Example:** *Rose, Sugarcane, Bougainvillea and Dahlia.*

#### 2. Layering:

- In this branches are bend close to ground and covered with moist soil which produce root and develop into new plants.

**Example:** *Jasmine, Magnolia etc.*

- On the basis of position layering are two types:

#### 1. **Mould layering:**

- Stem is pruned and the base of the plant is covered with soil.
- From the base new shoot develop which separate from parental plant and grow into a new plant.

**Example:** *Apple, Gooseberries etc.*

#### 2. **Air layering:**

- Piece of the branch is scraped and covered with polythene sheet to preserve moisture.
- Root arises from scraped part and then branch detached from parental plant which grow into new plant.

#### 3. **Grafting:**

- In this stem of the plant (i.e. *Scion*) is attached to another rooted (i.e. *Stock*).
- Joining has to be done such a way that vascular systems are united.
- Scion has desired character like large size fruit while stock has resistance capacity.

# ***grafting is only successful in Dicot not in monocot.***

# ***Wax is used to cover the place where grafting is being done which prevent infection.***

### **Micro propagation (Tissue Culture):**

- It is multiplication of plant in aseptical condition in artificial growth medium from explant (i.e. *small part like meristem tips, callus, embryos and anther*) etc.
- This technique is used to rapid production of sufficient number of plantlets which does not produce seeds.
- When explants place in nutrient it grows into unrecognized mass known as callus.

**Example:** *Asparagus, Orchids, Chrysanthemum*

### **Steps of micro propagation:**

1. Selection of plant material (i.e. *explants*)
2. Establishment of aseptical condition
3. Multiplication
4. Shoot elongation
5. Root induction or formation
6. Transfer in natural condition

### **Sexual Reproduction:**

- Production of new organism (i.e. *recombinant*) by combining genetic information from two individual of different sex or fertilizing two sex cells.
- Sex cells are **sperm/microspore** (i.e. *small and motile*) and **ovum/ megaspore** (i.e. *large and non motile*).
- Fertilization is also known as **syngamies** (i.e. **fusion of two haploid gametes**) which lead to form zygote (2n).

### **Phases of life cycle:**

- Three phases of life cycle are:

  1. Juvenile phase of life cycle.
  2. Reproductive phase
  3. Senescent

#### 1. **Juvenile Phase:**

- It is pre-reproductive phase or period.
- Characterized by enormous growth in which organism consume all available resources for growth and development.
- It is also called vegetative phase in plant.

#### 2. **Reproductive phase:**

- Reproductive organ develop and mature in this period.
- One set of sexual maturity is termed puberty.

# **Appearance of flower show sexual maturity in higher plants.**

- Sexually two type of flowering plant are found:

a. **Monocarpic Plant:**

- These plant flower only once in their life.

**Example:** Annual plant: wheat, Rice ; Biennial plant : Carrot, Radish; Bamboo, Neelakuranji.

b. **Polycarpic plant:**

- They are perennial, give flower repeatedly at interval every year.

**Example:** Apple, Mango, Orange, Grape vine, China rose.

3. **Senescent Phase:**

- Start from end of reproductive phase.
- Ageing of senescence lead to death.

# **Hormones are responsible for change over from one phase to another.**

**Event of Sexual Reproduction**

- There are three sequential event may occurs during sexual reproduction.

- Pre fertilization
- Fertilization
- Post fertilization

A. **Pre –fertilization:**

- Occurs prior to fertilization.
- It has two mainsteps/ events.

1. **Gametogenesis (i.e. formation of gamete)**

2. **Gamete transfer**

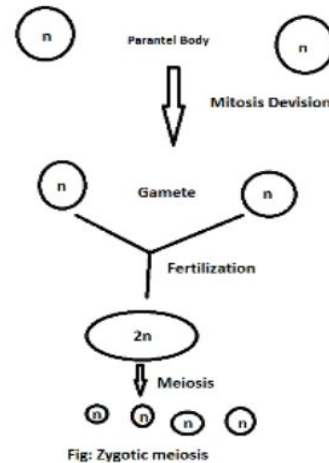
1. **Gametogenesis:**

- It refers formation of gametes (i.e. haploid).
- Takes place in gonads or reproductive structure.
- It involve **meiotic cell division** (i.e. reduce the chromosome number from diploid to haploid).
- Three type of meiosis or meiotic division can be seen in organism.

1. **Zygotic meiosis:**

- In this haploid parents produce **gametes** by mitosis which followed by fertilization and produce **diploid zygote** (vis. undergo meiosis and produce haploid spores).

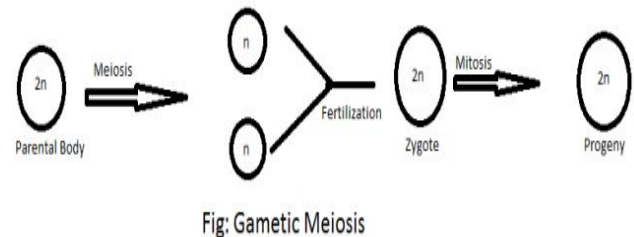
**Example:** Fungi, Protists, and Green Algae.



2. **Gametic meiosis:**

- In this the diploid organism produces gamete by **meiosis** which followed by fertilization and produce diploid **zygote** which undergo **mitotic division** and produce multicellular diploid organism.

**Example:** Animal, Some fungi, Brown algae.



3. **Sporic meiosis:**

- In this **mitotic division** takes place in zygote which results sporophyte (2n) .
- Sporophyte undergoes **meiotic division** and produce **spores (n)** - which followed by **mitotic division** and produce gametophyte (n).

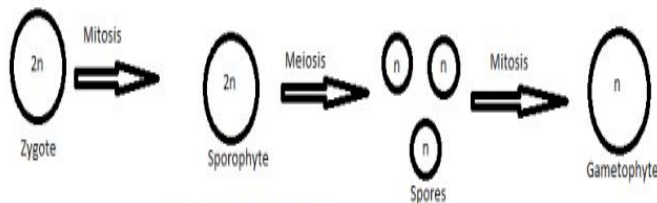


Fig: Sporic Meiosis

- **Isogametes or homogaetes** (i.e. two gametes which are similar in size and not possible to categorized into male or female) .

**Example:** Algae, Fungi and Protozoan.

- **Anisogametes or heterogametes** (i.e. when two different morphological gametes are formed).  
**Example:** sexually reproducing organism.

- In anisogametes or heterogametes male gamete known as **microgamete/ Antherozoid/ sperm** (i.e. small in size, motile and deficient in stored nutrients) and female gamete known as **macrogametes/ egg/ ovum**.
- Process which involve in union of anisogametes known as **anisogamy or heterogamy**.
- Sexuality of organism determine by the presence of reproductive structure in organism.

Example: Plant are - **bisexual** (i.e. having both male and female reproductive structure) or **unisexual** (i.e. having only male or female reproductive structure)

- Plant and Fungi can be – homothalic /v monoecious (i.e. bisexual) or heterothalic or dioecious (i.e. unisexual).
- Bisexual animals/ Hermaphrodites – Sponges tapeworms, Earthworms and leeches.
- Hermaphrodite may be **Protandrous** (i.e. male in early life history)

**Example** -clownfish or **protogynous** (i.e female in early life history)

**Example** – angel fish.

- # **Cockroach and human beings are unisexual species.**

## Gamete Transfer:

- In majority of organism male gametes are motile while female gametes are stationary. *Except few algae and fungi in which both gametes are motile.*
- In plant transfer of male gametes occur through a phenomenon i.e. **pollination**.
- Transfer of pollen grain from anther to stigma is known as pollination.
- In plant, on the basis of mode pollination are two type-
  1. Self pollination
  2. Cross pollination

## Fertilization:

- It is the process of union of gametes which results **zygote** (2n).
- In most aquatic organism (i.e. majority of algae and fishes as well as amphibians) have **external fertilization** (i.e. fusion of gametes takes place outside the body) due to that they show great synchrony between the sexes and release large number of gametes in order to enhance the chances of **syngamy** (e.g. bony fishes and amphibians).

- # **The major disadvantage of external fertilization is that the offspring are extremely vulnerable to predators threatening and survival up to adulthood.**

- In many terrestrial organism (i.e. fungi, reptiles, birds, mammals and plants like bryophytes to angiosperm) **internal fertilization** (i.e. fertilization occurs inside the body) takes place.
- In internally fertilized organism the egg is formed inside the body and male gamete are motile (because they have to reach the egg in order to fuse with it).

- # **in seed plant, the non-motile gametes are carried to female gamete by pollen tubes.**

## Post fertilization:

- Event occurs after the formation of zygote is called post fertilization.

## Zygote:

- Formation of zygote (2n) is universal in all sexual reproducing organism.
- Zygote formation in organism having **external fertilization** (*i.e. takes place outside the body*) while **internal fertilization** (*occurs inside the body*).
- Developments of zygote also depend on the life cycle of organism and environment to be exposed.
- In case of **fungi and algae** produce zygote having thick wall which resistant to desiccation (*i.e. prevention of moisture*) and damage as well as make them resting phase before germination.
- **Organism with haplontic life cycle** – zygote divide by meiosis to form haploid spores (*which develop into a haploid individuals*).

### Embryogenesis:

- It is formation of embryo from zygote.
- During embryogenesis zygote undergo **mitotic cell division** (*i.e. results increase the number of cells in the developing embryo*) and **cell differentiation** (*i.e. cell undergo certain modification to form specialized tissues and organs to form an organism*).
- animals are classified *on the basis of whether the development of zygote take place outside the body of the female parent or inside ( i.e. whether lay fertilized/ unfertilized eggs or give birth to young one)* into:
- In angiosperm- zygote develop inside the ovule followed by fall off of sepals and stamens.
- **Zygote** develops in embryo and **ovules** develop into the seed.
- **Ovary** ripens into fruit and **ovary wall** develops into *pericarp* (*i.e. thick cover*).
- After the dispersal seeds germinate under favorable condition and develop into new plants.

- Growth and development of embryo or seed ***without fertilization***.
- Occurs in some lower plants, invertebrates (*i.e. waterfleas, aphids*) vertebrates (*e.g lizards, salamanders, some fish, and even turkeys*).

### Parthenocarpy:

- Formation of fruit without prior fertilization which results fruits are seedless.
- Seedless parthenocarpic fruit can be induced in non-parthenocarpic varieties by artificial pollination with dead or altered pollen or by pollen from different types of plant.

**Example:** Pineapple, banana, cucumber, grape and orange.

# ***Application of auxin in paste form or by injection or by spraying cause parthenocarpic development.***

### Polyembryony:

- Condition in which two or more embryo develop from a single fertilized egg.
- Example: identical twins in human being and *Copidosoma truncatellum* (*i.e insect lay single egg in host worm and develop 2000 individuals*).

### Neoteny:

- It is attainment of sexual maturity by an organism still in its larval stage.
- Example:** Salamanders (*i.e. they become sexually mature but remain in aquatic and do not develop legs*).
- Neoteny some time also occurs in response of environmental stresses (*such as low temperature or lack of iodine*) while in improvement of condition organism develop into a fully mature adults form.
- Neoteny has important mechanism in the evolution of man because some have believe that man develop from the juvenile form of apes.

## Special mode of reproduction:

### Parthenogenesis: