

# Biology Notes Class-XII

## Chapter-1: Reproduction in organisms

### Introduction

- ✓ **Life span:** The period from birth to the natural death of an organism.
- ✓ Reproduction:
  - The biological process through which an organism gives rise to young offspring similar to itself.
  - Enables the continuity of the species, generation after generation.
- ✓ The process of reproduction of an organism depends on the following:
  - Organism's habitat
  - Its internal physiology
  - Several other factors
- ✓ Reproduction is of two types:
  - Asexual mode: Reproduction involving a single parent or without the involvement of gamete formation.
  - Sexual mode: Reproduction involving two parents (opposite sex) and also involves fusion of male and female gametes.

### Asexual Reproduction

- ✓ A single individual (parent) is capable of producing offspring.
- ✓ The produced offspring are clones of each other.
- ✓ **Clones:** Organisms which are morphologically and genetically similar.

#### Modes of Asexual Reproduction

- ✓ **Binary Fission:** In this process, the cell divides into halves, and each half develops into an adult (E.g.-*Amoeba*, *Paramecium*).
- ✓ **Budding:** In this process, the cell divides unequally to form buds, which remain attached to the parent initially, and then detach and develop, into a mature cell (E.g. - yeast).

#### ***Sporulation***

- ✓ Sporulation: The process of spore formation.
- ✓ It occurs under unfavourable conditions like desiccation and extreme temperature
- ✓ The products of multiple fission, become individually surrounded by resistant coats, called the **cyst wall** before they are released from the parent cell/body.
- ✓ The spore remains inactive during the unfavourable condition and upon arrival of favourable condition the cyst hatches and develops into an adult.

- ✓ Sporulation is thus not only a mean of reproduction but also enables the organism to survive during unfavourable conditions and disperse to new localities with air. ✓ It occurs in amoeba,

### ***Uniparental***

- ✓ It is the condition where a person receives two copies of a chromosome or part of a chromosome, from one parent and no copies from the other.

### ***Fragmentation***

- ✓ Fragmentation is a form of asexual reproduction where an organism splits into fragments.
- ✓ Each of these fragments develops into mature fully grown individual followed by mitosis. ✓ It occurs in some algae (Spirogyra), fungi, some annelids and sea stars.

### ***Regeneration***

- ✓ Regeneration is the process of renewal, restoration and growth.
- ✓ It can occur at the level of the cells, tissues and organs.
- ✓ It is common in Hydra, planarian flatworm and echinoderms.
- ✓ A lizard can discard a part of the tail when in danger, and the tail can regenerate later.
- ✓ In humans too the liver can regenerate if partially damaged.

### ***Specialised structures:***

- ✓ Zoospores (e.g.- Chlamydomonas)
- ✓ Conidia (e.g.- Penicillium)
- ✓ Buds (e.g.- Hydra)
- ✓ Gemmules (e.g.- Gemmules)

### ***Vegetative reproduction:***

- ✓ Eyes in tuber (Potato)
- ✓ Rhizome (Ginger)
- ✓ Bulbil (Agave)
- ✓ Leaf buds (*Bryophyllum*)
- ✓ Offset (Water hyacinth)
- ✓ Runner (Gladiolus)
- ✓ Sucker (Tomato)
- ✓ Bulb (Onion)
- ✓ Water hyacinth: One of the most invasive weeds found growing wherever there is standing water.
  - It drains oxygen from the water, which leads to the death of fishes.

- It is also referred to as 'terror of Bengal'.
- ✓ **Phases of growth:**
  - **Juvenile phase** (Vegetative phase in plants): the stage of growth and maturity, before the organism can reproduce sexually.
  - **Reproductive phase:** Begins at the end of the Juvenile phase. ○
  - **Senescence phase** (old age): The end of reproductive phase ▪ The rate of metabolism slows down.
    - Ultimately leads to death.
- ✓ Hormones are responsible for the transitions between the three phases.
- ✓ **Plants exhibiting unusual flowering phenomenon:**
  - Bamboo: flower only once in their life time generally after 50-100 years, produce a large number of fruits and die.
  - *Strobilanthus kunthiana* (Neelakuranji): flowers once in 12 years.
- ✓ **Oestrus cycle:** Cyclic change in the activities of the ovaries and the oviduct in nonprimate mammals like rats, sheep, dogs, cows and tigers.
- ✓ **Menstrual cycle:** Cyclic change in the activities of the ovaries and the oviduct in primates like monkeys, apes and humans.
- ✓ **Continuous breeders:** Mammals which are reproductively active throughout their reproductive phase
- ✓ **Seasonal breeders:** Mammals that can reproduce only in the favourable seasons.
- ✓ **Events in sexual reproduction:** The events of sexual reproduction through elaborate and complex, follow a regular sequence:
  - Pre-fertilisation ○ Fertilisation ○ Post-fertilisation events

### Pre-fertilisation events

- ✓ All the events of sexual reproduction before fusion of gametes.
- ✓ The two main events are ○ gametogenesis ○ gamete transfer

### **Gametogenesis**

- ✓ The process of formation of gametes (male and female).
- ✓ Gametes are haploid.
- ✓ **Homogametes** (isogametes): Male and female gametes are similar in appearance. E.g.- Some algae.
- ✓ **Heterogametes:** Male and female gametes are morphologically distinct.
  - Male gametes are called antherozoid or sperm ○ female gamete is called the egg or ovum

### **Sexuality in organisms**

- ✓ Bisexual: Organisms with both male and female reproductive structures.
- ✓ Unisexual: Organisms with either male or female reproductive structures.
- ✓ Homothallic / Monoecious: Bisexual condition in several plants and fungi. (cucurbits, coconuts)
- ✓ Heterothallic / Dioecious: A unisexual condition in several plants and fungi. (papaya, date palm)
- ✓ **Staminate**: Unisexual male flower bearing stamen.
- ✓ **Pistillate**: Unisexual female flower bearing pistil.
- ✓ Hermaphrodites: Bisexual animals that possess both male and female reproductive organs. (Earthworms, sponge, tapeworm and leech)

### **Cell division during gamete**

**formation** ✓ Gametes are haploid.

- ✓ Haploid plant body: Several organisms belonging to monera, fungi, algae and bryophytes.
- ✓ Diploid plant body: organisms belonging to pteridophytes, gymnosperms, angiosperms and most of the animals including human beings.
- ✓ **Meiocytes**: Gamete mother cell undergoes meiosis to give rise to gametes.

### **Gamete Transfer**

- ✓ For their fusion to take place, the gametes need to be transferred.
- ✓ In most organisms, the male gametes are motile, while the female gametes are non-motile, and the male gametes need a medium for their movement.
- ✓ A large number of male gametes do not make it to the female gamete, and hence, several thousands of male gametes are produced to overcome this loss.
- ✓ In angiosperms, the pollen grain carries the male gamete and the ovule carries the female gamete.
- ✓ Pollen grains are produced in the anther and need to be transferred to the stigma for fertilisation to occur.
- ✓ This is easy in monoecious plants as both the anther and the stigma is present close by; in dioecious plants, it takes place by pollination.

### Fertilization

- ✓ **Syngamy**/ fertilisation: Fusion of male and female gamete.
- ✓ **Zygote**: Diploid cell as a result of syngamy.
  
- ✓ **Parthenogenesis**: Formation of new organisms by the development of female gamete without fertilisation. (honey bees, rotifers, Turkey)
- ✓ External fertilisation: Syngamy occurring outside the body of the organism. (Algae, Fish, Amphibian)

- ✓ Internal fertilisation: Syngamy occurring inside the body of the organism. (reptiles, birds, mammals and majority of plants like bryophytes, pteridophytes, gymnosperms and angiosperms)
- ✓ In most terrestrial organisms, fertilisation is internal, i.e., it takes place inside the female body. In this process, the male gamete is motile and reaches the female gamete to fuse with it, thereby forming a zygote. Male gametes are produced in large numbers.

### Post-Fertilisation Events

- ✓ These include all the events after fertilisation.

#### **Zygote**

- ✓ A diploid zygote is formed as a result of the fusion of gametes in all organisms.
- ✓ In external fertilisation, the zygote is formed in an external medium, and in internal fertilisation, the zygote is formed inside the individual.
- ✓ The development of a zygote depends upon the life cycle of an organism and its surroundings.
- ✓ In some organisms, the zygote does not develop immediately and develops a thick wall around itself. This wall is resistant to damage and desiccation.
- ✓ A zygote is a vital link that ensures continuity of species between organisms of one generation and the next.

#### **Embryogenesis**

- ✓ It is the process of development of an embryo from the zygote.
- ✓ The zygote undergoes mitotic cell division and cellular differentiation for the further development.
- ✓ Based on the location of development of zygote; animals can be grouped into the following two categories
  - **Oviparous:** Egg laying animals.
    - A hard calcareous shell covers the fertilised eggs.
    - The young ones hatch out after a period of incubation.
    - E.g., birds, reptiles
  - **Viviparous:** Animals giving birth to young ones.
    - The development of the zygote into a young one takes place inside the body of the female organism.
    - After attaining a certain stage of growth, the young ones are delivered out of the body of the female organism.
- ✓ In flowering plants: Zygote is formed inside the ovule.
- ✓ Post fertilisation events in flowering plants:
  - Pistil remain intact to the plant
  - Sepals, petals and stamens wither and fall off
  - Zygote becomes embryo
  - Ovule

becomes seed ○ Ovary becomes fruit ○ Seeds germinate under favourable conditions to produce new plants.

Rashmi Kaur