

Reproduction in Organisms

Asexual Reproduction

Life span

- It is the period between the birth and natural death of an organism.

Reproduction

- It is a biological process through which living organisms produce offspring that are similar to themselves. Reproduction is of two types: sexual and asexual.

Asexual reproduction

- It requires only one parent; thus, it does not involve the fusion of gametes.
- Offspring produced are exact copies of their parents.
- Clones are morphologically and genetically similar individuals.
- **Binary fission** is a mode of asexual reproduction where a single cell is halved.
Example: *Amoeba* and *Paramecium*
- Fragmentation is a mode of asexual reproduction seen in *Spirogyra*.

Organisms and their reproductive structures

Organisms	Asexual reproductive structures
<i>Hydra</i> and yeast	Buds
<i>Chlamydomonas</i>	Zoospores
<i>Penicillium</i>	Conidia
Sponge like <i>Sycon</i>	Gemmules

Vegetative propagation

- This term is used for asexual reproduction in plants.
- It is the ability of plants to reproduce by producing new plants from vegetative propagules such as runners, rhizome, sucker, tuber, offset and bulb.

Vegetative propagules	Examples
Eyes	Potato
Rhizome	Ginger
Bulbil	<i>Agave</i>
Leaf buds	<i>Bryophyllum</i>
Offset	Water hyacinth

Sexual Reproduction: Pre-Fertilisation Events

Sexual reproduction

- It involves the fusion of the male and female gametes from two individuals of different sexes. Thus, the offspring are not identical to their parents.
- The period of growth in animals is termed as the **juvenile phase** while in plants, it is known as the **vegetative phase**.
- **Oestrous cycle:** Cyclical changes that take place in the female reproductive system of non-primate mammals; e.g., cows, sheep, dogs
- **Menstrual cycle:** Cyclical changes that take place in the female reproductive system of primates; e.g., monkeys, apes, humans
- Three distinct stages in sexual reproduction are: pre-fertilisation events, fertilisation and post-fertilisation events.

Events in sexual reproduction

- **Pre-fertilisation events**
 - **Involves gametogenesis and gamete transfer**
 - **Gametogenesis:** Process of formation of the male and female gametes
 - **Homogametes (isogamous):** Both the male and female gametes are similar in appearance; e.g., some algae
 - **Heterogametes (anisogamous):** Both the male and female gametes are dissimilar in appearance
 - **Bisexual organisms or hermaphrodites:** Organisms that possess both the male and female reproductive organs; e.g., earthworm, sponge, tapeworm, etc.
 - **Homothallic and monoecious** are terms used for describing **bisexual** condition in plants.
 - **Unisexual organisms:** Organisms that possess either the male or the female reproductive organs; e.g., cockroach

- **Heterothallic and dioecious** are terms used for describing **unisexual** condition in plants.
- Most of the parental body is haploid in organisms belonging to monera, fungi, algae and bryophytes.
- Parental body is diploid in human beings, and in most organisms belonging to pteridophytes, gymnosperms and angiosperms.
- **Meiocytes (gamete mother cells)** are diploid cells that undergo meiosis to form haploid gametes.
- **Gamete transfer:** It is the transfer of one gamete to another to facilitate fertilisation. In plants, transfer of gametes occurs by pollination.
- **Pollination** is the process of transfer of male gametes from the anther to the stigma in plants.

Sexual Reproduction: Fertilisation Events

Fertilisation (Syngamy)

- It is the process of fusion of the male and female gametes to form a diploid zygote.
- **Parthenogenesis:** It is the process of formation of a new individual without fertilisation.
- Two types of fertilisation –
 - External fertilisation: Fusion of the male and female gametes occurs outside the female body; e.g., algae, fishes
 - Internal fertilisation: Fusion of the male and female gametes occurs inside the female body; e.g., reptiles, birds, mammals

Sexual Reproduction: Post-Fertilisation Events

- Post-fertilisation events
 1. It includes the formation of the zygote and the formation of the embryo (embryogenesis).
 2. Zygote: It is formed after the fusion of the haploid male and female gametes.

- Haplontic life cycle

Zygote $\xrightarrow{\text{meiosis}}$ Haploid spores $\rightarrow$ Haploid adult

Example: *Volvox*, *Spirogyra*

- Diplontic life cycle

Example: gymnosperms and angiosperms

- Embryogenesis : Process of development of the embryo from the diploid zygote

Based on the development of the zygote, animals are divided as –

- Oviparous: Female lays egg outside its body; e.g., reptiles and birds
- Viviparous: Eggs are produced inside the female body. Female gives birth to young ones. E.g., all mammals, including human beings.
- The chances of survival of the young ones are more in viviparous animals than they are in oviparous animals. It is because viviparous animals can provide proper care and protection to the egg or the embryo.
- In flowering plants (angiosperms), after fertilisation –
 - Zygote is formed inside the ovule
 - Floral parts such as sepals, petals and stamen fall off
 - Zygote develops into the embryo
 - Ovules develop into seeds
 - Ovary develops into fruit