

REPRODUCTION IN ORGANISMS

Reproduction: defined as a biological process in which an organism gives rise to young ones (offspring) similar to itself.

Asexual reproduction:

- Offsprings produced by single parents.
- Without involvement of gamete formation
- Offsprings are genetically identical to their parents.

Methods of asexual reproduction:

- Cell division as a method of asexual reproduction as in Protista and monera.
- Binary fission e.g. Amoeba, Paramecium.
- Budding: e.g. yeast.
- Asexual reproductive structures:
 - **Zoospores:** aquatic fungi, *Chlamydomonas*.
 - **Conidia:** *Penicillium*.
 - **Bud:** *Hydra*
 - **Gemmules:** *sponges*.
- Vegetative propagation units in plant: (Vegetative propagules)
 - Runner, rhizome, sucker, tuber, offset, bulb.

Sexual reproduction:

- Involvement of single or two individual.
- Production of male and female gametes (haploid)
- Gametes fused to form a diploid zygote.
- Zygotes developed into new organism.
- The offsprings are not genetically identical with their parents.

Features of sexual reproduction:

- Period between birth and sexual maturity is called **juvenile phase**. It is known as **vegetative phase** in plant.
- Bamboo species flower only once in their life time generally after 50-100 yr.
- *Strobilanthus kunthiana* (neelakranji) flowers once in 12 years.
- **Oestrus cycle:** cyclical changes during reproduction in non-primate mammal like cows, sheep, rats, deers, dogs, tiger etc.
- **Menstrual cycle:** cyclical changes during reproduction in primate mammals like monkeys, ape, and humans.
- **Seasonal breeders:** reproductive cycle takes place in favourable seasons as in wild animals.
- **Continuous breeders:** reproductively active throughout their reproductive phase.

Pre-fertilization events:

- Process of gamete formation is **gametogenesis**.
- Two gametes are similar in appearance are called **homogametes (isogametes)**.
- Gametes produced are of two morphologically distinct types called **heterogametes**.
- Male gamete is called **antherozoids** or **sperm** and the female gamete is called **ovum** or **egg**.

Sexuality in organism:

- Plant having both male and female sex organ called **homothallic** or **monoecious**.
- Plants having only one sex organ is called **heterothallic** or **dioecious**.
- In flowering plants, the unisexual male flower is **staminate**, i.e. bearing stamens, while the female is **pistillate** or bearing pistils.
- Animal having one type of reproductive system, called **unisexual**.
- Animal having both male and female reproductive system, called **hermaphrodite** or **bisexual**.

Cell division during gamete formation:

- Gametes in all heterogametic species two types namely **male** and **female**.
- Gametes are always haploid irrespective of parent's ploidy.
- A haploid parent produces gametes by **mitotic** division.
- Diploid parent produces gametes by **meiotic** division.
- In diploid organisms specialized cells called **meiocytes** (gamete mother cell) undergo meiosis to produce haploid gametes.

Gamete transfer:

- Male and female gamete must be physically brought together to facilitate fusion called fertilization.
- In most cases male gametes are motile, female gametes are non-motile.
- In case of few fungi and algae, both male and female gametes are motile.
- In most cases water is the medium for gamete transfer.
- Male gametes are produced in several thousand times the number of female gametes produced to compensate the loss during transfer.

Fertilization:

- Fusion of male and female gamete is called **fertilization** or **syngamy**.
- The female gamete undergoes development to form new organism without fertilization. This phenomenon is called **parthenogenesis**.
- Gametic fusion takes place outside the body i.e. water is called **external fertilization**.
- There must be synchrony of gamete release, large number of gametes released to enhance the chance of fertilization.

- Enable the individual to produce large number of offsprings.
- A major disadvantage is that the offsprings are extremely vulnerable to predators.
- Fertilization takes place inside the body is called **internal fertilization**.

Zygote:

- Formation of zygote after fertilization is universal in all sexually reproducing organisms.
- Zygote is formed usually **in water** in case of **external fertilization**.
- Zygote is formed **inside the body** of the organism in **internal fertilization**.
- Zygote of fungi and algae develops a thick wall that is resistant to desiccation and damage.
- Organism with haplontic life cycle, zygote undergoes meiosis to produce haploid spores.

Embryogenesis:

- Development of zygote into an embryo is called **embryogenesis**.
- Zygote undergoes **cell division** (mitosis) and **cell differentiation**.
- Oviparous animal which lays eggs and development takes place inside egg.
- Viviparous animal gives birth to the young. The development takes place inside the body of the female.
- In plants:
 - **Zygote** developed into **embryo**.
 - **Ovule** developed into **seed**
 - **Integument of the ovule** developed into **seed coat**.
 - **Ovary** developed into **fruit**.
 - **Ovary wall** developed into **pericarp**.