

UNIT:VI

REPRODUCTION

CHAPTER 1

REPRODUCTION IN ORGANISMS

Reproduction :- It is biological process in which an organism give rise to young ones of its own kind to continue the race from one generation to another.

Every living organism in the world live for “Certain period of time from birth to its natural death called life span”.

Different organism have different life span.

Plants		Animals	
Rose	10 years	Fruit fly	1 month
Banana	2- 3 year	Butter fly	1- 2 weeks
Rice plant	3-7 months	Dog	12 -25 years
Banyan tree	2000 years	Cow	20-25 years
		Crocodile	45 – 50 year -60 years
		Parrot	140 years
		Horse	20 years

There are 2 types of reproduction such asexual reproduction and sexual reproduction.

Asexual reproduction (a= with out sex) is also known as agamogenesis or agamogeny. In which an individual produces young ones with out the fusion of gametes.

The young ones produced morphologically genetically similar to one another are called clones.

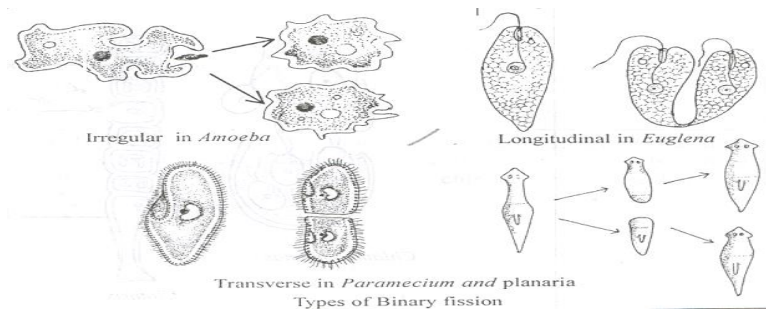
Characteristics:

- It is uniparental
- There is no fusion of gametes.
- Meiosis is absent, all divisions are mitotic.
- Progeny produced by asexual reproductions uniform in size, shape etc.
- It is quick method of multiplication.

Types of asexual reproductions :-Binary fission ,Budding ,Sporulations ,Encysments Etc.

Binary fission :-It is a process in which the parent cell divides into two more similar equal sized daughter cells.

Eg: Amoeba, Paramecium, Euglena

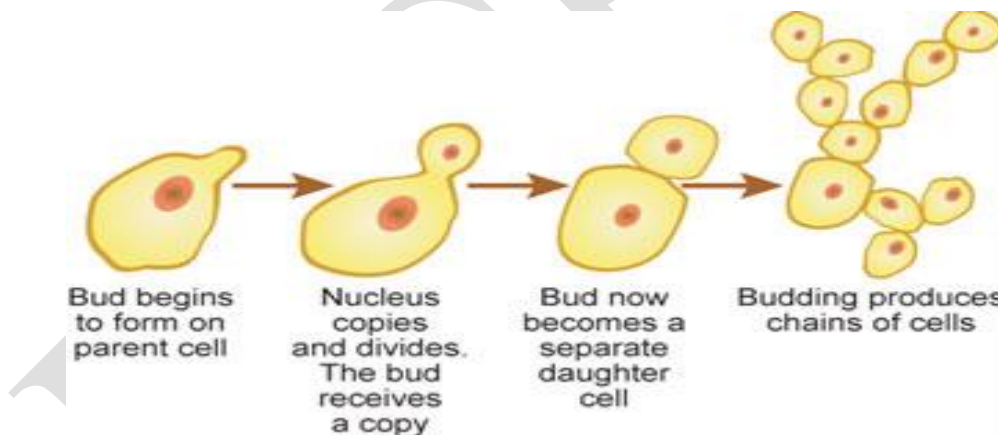


Budding: It is a process in which new organisms develops as small out growth on the surface parent cell. **Eg:** Yeast, Hydra

Budding are of two types :

1. Exogenous buds / external budding. Eg : Yeast

The small buds are developed externally as the parent. It was remain attached to parent or detached from parent cell and later develops in to an adult cell.



2. Endogenous buds/ internal budding or gemmules. Eg: Fresh water sponges

The buds are formed in side the parental by for a number of undifferentiated cells enclosed in a chitinous envelope or in a shell with spicules, which can over come unfavourable condition. Under favourable condition it develops into new individual.

Sporulation: The organism produces special spores called Sporulation. **Eg:** penicillium

Conidia are exogenous , non-motile out growths produced at the tip of special hyphae.

Zoospores: Zoospores are produced in algae these are flagellated and motile are produced in zoosporangium.

Eg: Chlamydomonas, Ulothrix.

Encystment: Under unfavourable conditions Ameoba secretes a thick hard wall covering or cyst. This phenomenon is called encystations. Under favourable condition cysted amoeba on multiple fission produces a number of amoeba.

Vegetative propagation: Asexual reproduction in plants is called vegetative propagation. It is a process multiplication of plant is by any fragment or part of plant get detached from the parent plant under favourable condition develops into new plant.

Vegetative propagation by stem: Stem is main source of vegetative propagation.

Underground stem: Vegetative propagation takes place by formation of buds. When buds detached from the parent plant develop into individual plant. **E.g.:** Rhizome in Ginger, turmeric. Stem tuber in Potato, Bulb in Onion, Garlic.

Sub aerial stem: Vegetative propagation is by the formation of new shoots, which breaks and develops in to new plant. **E.g.:** Sucker in Chrysanthemum, Mint, Offset in Eichhornia, Pistia,.

Water hyacinth is also referred as 'Terror of Bengal' or Scourge of water bodies. It is a common aquatic invasive weed. Grows in standing water. It is found in Amazon basin of South America. It was brought to India. Because of beautiful flowers and shape of leaves. It spreads all over the water in a short period of time. It is very difficult to get rid off them because it absorbs oxygen from water, leads to death of fishes.

Vegetative propagation by leaves: The adventitious buds developed at the margin of leaf. When it detaches from parents plant develops into a new plant an suitable substratum. **E.g:** Bryophyllum.

Sexual reproduction:

Is also known as **Amphimixis/ Amphigamy.**

Sexual reproduction involves the fusion of gametes formed by the same individual or by different individual of opposite sex.

Characteristics-

- Production of male and female gamete by the organism.
- On fusion forms Zygote.
- Transmission of heredity character takes place.
- Possibility of variation in population.
- Variation is raw material for evolution.

Stages of lifecycle:

There are 3 stages- i. Pre-reproductive stage.

ii. Reproductive stage.

iii. Senescence stage.

Pre- reproductive/ juvenile/ Vegetative phase:-The organism exhibits the stages of growth and maturity in life before they reproduce sexually is juvenile phase in animals. Juvenile phase is also known as vegetative phase in plants.

Reproductive phase Maturity: The end of juvenile indicates the reproductive phase in higher plants is characterized by flowering.

Some of plants exhibit continuous flowering through out the year. **E.g.:** Periwinkle, Coconut.

Some of plants exhibit seasonal flowering **E.g.:** Mango, Jack fruit, Papaya.

Some plants exhibits unusual flowering.

The species of bamboo exhibits flowering once in their life time . The plant *Strobilanthus kunthiana* (Neelakaranji) flower once in 12 year (i.e. in sept – oct ,2006) is found in hilly areas of kerala, Karnataka & Tamilnadu.

Among birds, some of birds, lived in nature lay eggs seasonally. Where as poultry birds lay eggs continuously .Among animals some are seasonal breeders and some are continuous breeders.

As in seasonal breeders like in primates, like cow, sheep, Deer, exhibits oestrous/heat period and anoestrus/ rest period. The cyclic changes in reproductive phase is oestrous cycle. In this the female receive the male for copulation only during oestrous period. Anoestrus period is non breeding. Eg: Frog, Birds.

The continuous breeders exhibits menstrual cycle. **E.g.:** Primates like monkey, Apes and Human.

Senescence /Old age: End of reproductive phase the body metabolite rate slows down leads to death of an individual. Both in plants and animals hormones and phytohormone are responsible for all the 3 phases. Interaction between hormones and environmental factor regulate reproductive associated with behavioural expression of organism.

Events in Sexual reproduction:

The events involved in sexual reproduction are grouped into 3 stages.

1) Pre fertilization

2) Fertilization

3) Post fertilization

Pre fertilization:

It is further classified in to 2 events namely

1. Gametogenesis.
2. Gamete transfer.

Gametogenesis: It is process of formation of gametes from gonads/ sex organs.

Isogametes or Homogametes

E.g.: Algae, Protozoan

The gametes are morphologically similar called homogametes or isogametes.

Anisogametes or Heterogametes

E.g.: Higher organisms.

The gametes are morphologically dissimilar are called Anisogametes or Heterogametes. Malegametes called anthrozooid or sperm, Whereas the female gametes is called egg or ovum . Generally all the gametes haploid.

Cell division during gamet formation:

In lower forms algae fungi, Bryophyte the parent body is haploid and the gametes are produced by mitotic division. Meiosis occurs only in zygote during development.

In higher forms like pteridophytes, gymnosperms, angiosperms & animals. The parental body is diploid. The gametes are produced by meiosis.

In diploid organisms gametogenesis takes place by specialized cell meiocytes (Gametic mother cells) on meiosis results in the formation of haploid gametes.

Name of the organism	Chromosome number in meiocyte (2n)	Chromosome number in gamete(n)
Human being	46	23
House fly	12	6
Rat	42	21
Dog	78	39
Cat	38	19
Fruit fly	8	16
Ophioglossum	1260	630
Apple	34	17
Rice	24	12
Maize	20	10
Potato	12	24
Butterfly	380	190
Onion	32	16

Sexuality in organisms

It involves the fusion of gametes from 2 different individuals. The sex cell or gametes may be produced in same plant or different plants.

Homothallic and monoecious (Bisexual condition)

The organism is having both the male and female reproductive structure in it.

Heterothallic and dioecious (unisexual condition).

The male and female reproductive structure is found on different organism.

Unisexual: Organisms having either male or female reproductive structure. **Eg:** Cockroach .

Bisexual: An organisms having both the male and female reproductive structure . The organisms like Earthworms, Sponge , Tape worm have both male and female reproductive structure called **hermaphrodites**.

In flowering plants unisexual flowers may be

Staminate:- The flower is having only male reproductive structure (androceium)

Pistilate: The flower have only female reproductive structure (gynoceium)

Monoecious: (Bisexual) The plant produce both male or female flowers. **Eg:** Cucurbita, coconut.

Dioecious(Unisexual) The plant produce either male or female flowers. **Eg:** Papaya, Date palm, Marchantia, Chara

Gamete transfer: The transfer of male gamete towards female gamete for fertilization. In lower organisms both the male and female gamete are motile. Eg: Algae & Fungi.

In same plants like algae, bryophytes, pteridophytes water is required for gametes transfer.

In higher organisms male gamete is motile and female gamete is non-motile. In flowering plants or seed plant, pollen grains are the carrier of male gamete. The transfer of pollen grain to stigma of a flower is called pollination.

A number of agents like wind, water, insects helps in pollination. Further development of pollen grain take place before fertilization. Pollen grain germinate and produces pollen tube inside the style of the gynoceium. Reach the ovule and release the male gametes into embryo sac.

As in dioecious animals, after the formation of male and female gamete. The transfer of gametes takes place by special mechanism for fertilization.

Fertilization:

The fusion of male with female gamete is called fertilization. It is also referred as **Syngamy**. It results in the formation of zygote (2n). There are two types of fertilization –

1. External fertilization- Fertilization takes place outside the body **E.g.**, Bony fishes and Frog.
2. Internal fertilization- Fertilization takes place inside the body. **E.g.**, Reptiles, Birds, Mammals

Parthenogenesis:

The female gamete develops into new organism without undergoing fertilization . This phenomenon is called Parthenogenesis. **E.g.**, Rotifers, Honeybee, Lizards.

Post-fertilization events:

Zygote: Zygote is formed after the union of male and female gamete. It may formed in the external medium or inside the body of organism.

- Zygote is a link between the continuity of species between organisms of one generation to next.
- In sexually reproducing organism life begin as s single cell zygote.
- In algae and fungi, Zygote develops a thick wall therefore resistant. It undergoes a period of rest (Dormancy). Later it germinates into an organism.
- The organism which shows Haplontic life cycle, Zygote(**2n**) divides by meiosis to form haploid spores(**n**) develops into haploid individuals.

Embryogenesis:

The process of development of embryo by the zygote is called **embryogenesis**. The zygote undergoes cell division and cell differentiation to develop into an embryo.

Based on the development of zygote outside the body or inside female organisms are classified into 2 types.

Oviparous: E.g., Reptiles, Birds.

These are egg laying organisms. The fertilized eggs are covered by calcareous shell. Zygote develops into embryo. After the incubation Youngs are hatched out.

Viviparous- E.g., Human being.

These organisms gave birth to their young ones. The zygote develops into a young inside the body.

- After attaining certain growth young ones are delivered from the female body. Proper embryonic care and protection is taken in viviparous organism.

In **flowering plants**, after the fertilization the zygote is formed inside the ovule.

- Ovary develops into fruits.
- Ovary wall is develops into fruit wall called pericarp.
- Ovule develops into seeds.
- Seeds after dispersal, in favorable condition germinates and develop into new plant.