CHAPTER – 8
HOW DO ORGANISMS REPRODUCE

***MEANING OF REPRODUCTION*-** **Reproduction is the process by which living organisms produce new individuals similar to themselves.**

***Purpose of Reproduction*-Reproduction ensured continuity of life on earth.**

***Basic Features of Reproduction* -The modes of reproduction vary in different organisms. However all of these have certain common basic features. These are -**
(I) Replication of DNA (ii) cell division
(iii) Formation of reproductive bodies or units (IV) development or reproductive bodies into offspring.

***FORMS OF REPRODUCTION*-Animals reproduce in a variety of ways. Which are categorized in two categories i.e. asexual and sexual reproduction.**

***Asexual Reproduction* :**

***Definition* - Production of offspring by a single parent without the formation and fusion of gametes iscalled asexual reproduction. It is more primitive type or reproduction. It ensures rapid increase in number.**

***Occurrence* : Asexual reproduction occurs in protozoans and some animals such as sponges, coelentrates, certain worms and tunicates. It is absent among the higher invertebrates and all vertebrates.**

***Type of Asexual Reproduction:* Asexual reproduction takes place in the following ways :**

(*i) Fission* - it is the simple form of reproduction in which unicellular organism either divide into two or more organisms.

- **It is also divided into two types –**

***(A) Binary fission* : It is a type of reproduction in which nuclear division is followed by the appearance of a constriction in the cell membrane, which gradually deepens inward and divides the cytoplasm into two parts, each with one nucleus. Finally two daughter cells are formed. E.g. Amoeba**

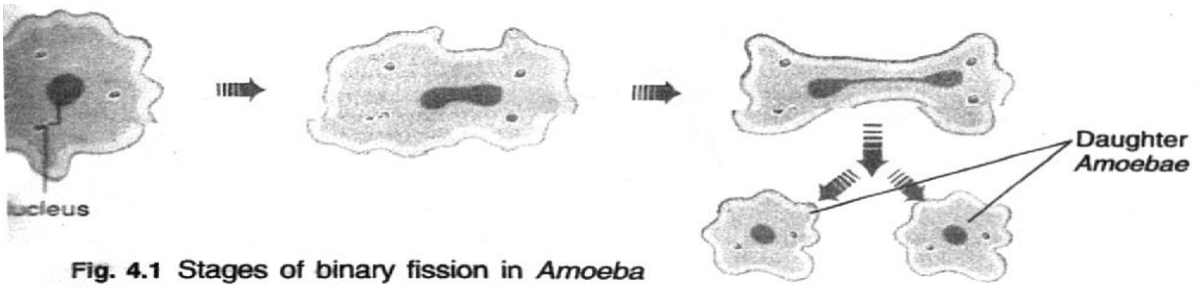


Fig. 4.1 Stages of binary fission in *Amoeba*

B) Multiple fission - Sometimes the nucleus divides several times into many daughter nuclei.The daughter nuclei arrange at the periphery of the parent cell, and a bit of cytoplasm around each daughter nuclei is present. nucleus develops an outer membrane. Finally the multinucleated body divides into many daughter cells. e.g. Plasmodium.

(ii) Budding : Formation of daughter individual from a small projection which is called as bud, arising on the parent body is called as budding.

Budding is also of two types:

(A) Exogenous budding -[External budding] In this, bud arises from the surface of parent body, e.g., Hydra.

_(B)_ Endogenous budding- [Internal budding] In this, bud arises inside or within the parent body e.g., Sponges.

NOTE - During the process of budding, the bud remains attached to the parent body so as to derive it's nutrition from the parent but as it matures, it get's detached from the parent body.

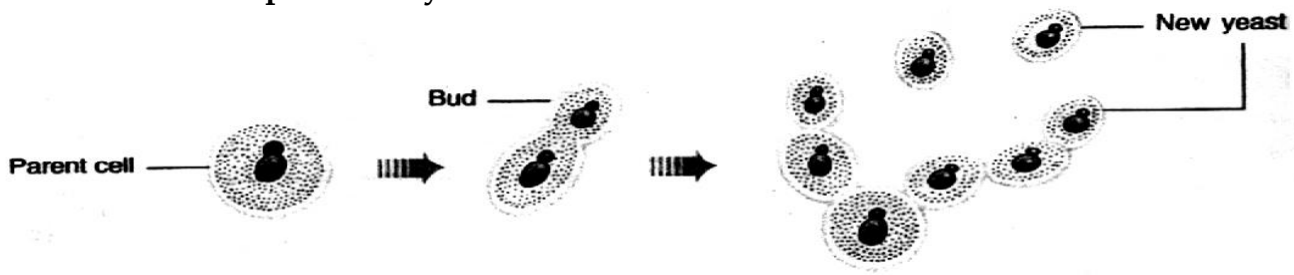
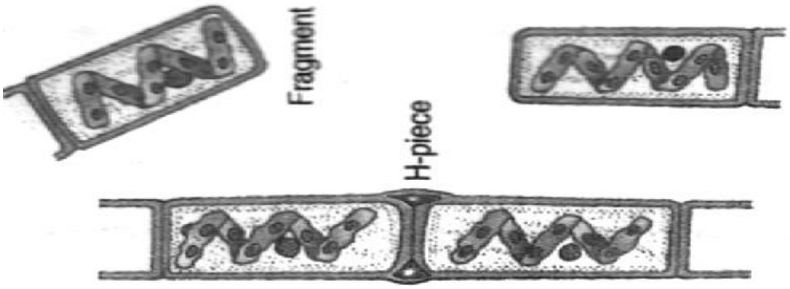


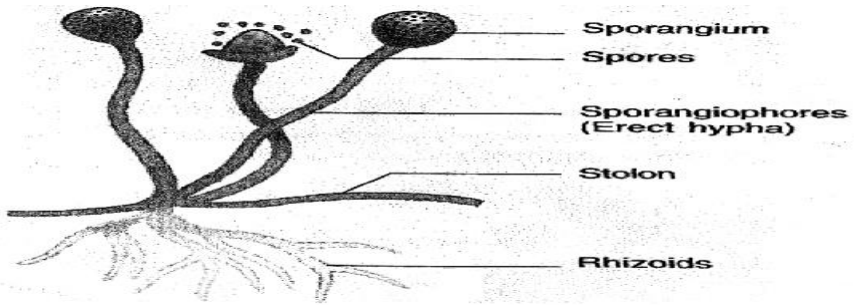
Fig. 4.4 Budding in yeast

(iii) Fragmentation :-It is a type of reproduction or the regeneration ability of the organisms to replace their lost part.In this process an entire new organism can grow from certain pieces or cells of the parent organisms. e.g.Flatworm.



(iv) Spore formation **-It is a process of reproduction most commonly found in fungi and bacillus bacteria.**

- **During this process a structure known as sporangium is formed. In this structure nucleus divides several times and each nucleus with a little trace of cytoplasm forms a spore.**
- **These spores are then liberated out and develop into a new hyphen, e.g. Rhizopus.**



(v) Vegetative propagation **-This is a type of reproduction found in higher plants in which a new plant is formed from vegetative part of the plant such as roots, stems or leaves.**
It is of following types-

(A) Cutting **-This is the very common method of vegetative propagation practised by the gardeners all over the world. It is the process in which a vegetative portion from plant is taken and is rooted in the soil and a new plant produce from this part. e.g. Grapes, Sugarcane etc.**

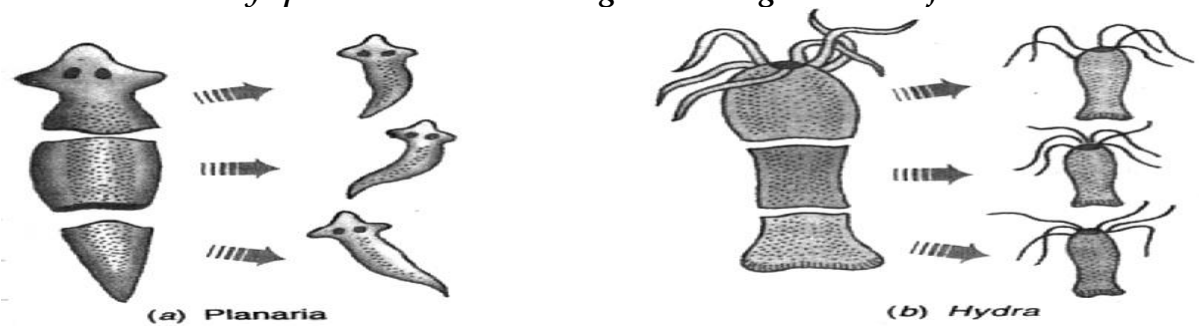
(B) Layering **-In this process the development of adventitious roots is induced on a stem before it gets detached from parent plant, e.g, Mango, roses etc .**

• Significance of vegetative propagation

- **It is used to propagate a plant in which viable seeds are not formed or very few seeds are produced e.g. Orange, pineapple, banana etc.**
- **Vegetative propagation helps us to introduce plants in new areas where the seed germination fails to produce mature plant due to change in environmental factors and the soil.**
- **Vegetative propagation is a more rapid, easier and cheaper method of multiplication of plants.**
- **By this method a good quality of a race or variety can be preservers.**

- **Most of the ornamental plants are propagated through vegetative propagation. E.g. Rose, Tulip etc.**

6 ***REGENERATION****- When the simple animals like Hydra, Planaria develop a new individual from their broken older part it is known as regeneration.*
It is carried out by specialised cells which grow in large number of cells.



Sexual Reproduction **-**

• *Definition*-Production of offspring by formation and fusion of special cells known as gametes.
These are contributed generally by two parents. i.e. male gamete and female gamete is known as sexual reproduction.
• *Occurrence*: Sexual reproduction occurs nearly in all animals including those which reproduce asexually.
In most animals there are two sexes male and female, and the differences between them are genetically determined.

• *Types of sexual reproduction-*

Syngamy **-It involves the complete and permanent fusion of two gametes to form a composite cell called zygote. This is a common mode of sexual reproduction.**

Conjugation **: It involved temporary pairing of two parents which exchange their pronuclei and then undergo the process of separation .e.g Paramecium etc.**

Characteristics of sexual reproduction -

- **It is generally biparental [i.e. it involves two parents]**
- **It involves formation and fusion of gametes.**
- **Cell divisions are both meiotic & mitotic during gamete formation and mitotic during development of zygote into an offspring.**
- **The offspring's are not genetically identical to the parents.**
- **Fertilization in case of humans is internal.**

Significance of sexual reproduction :

- **It results in multiplication and perpetuation of species.**
- **It contributes to evolution of the species by introducing variation in a population much more rapidly than asexual reproduction.**

General Terms-

- ***Fertilization*- It is the process of fusion of gametes.**
- ***Unisexual organism* -In case of humans male and female sex organs are separate and therefore called unisexual.**
- ***Bisexual*- In plants and some organisms like tapeworm, earthworm etc. both male and female organs are present in the same individual and therefore called as bisexual.**
- ***Gonads-* Organs which are involved in the formation of gametes are called as gonads.**
- ***Copulation or mating*- The process of transfer of male gametes into female body.**
- **Hermaphrodite:- An organism in which both the male and female sex organs are present is called hermaphrodite or bi-sexual. Hydra and earthworm are such organism.**
- **Gamete:- Two types of reproductive cells produced in males and females are called gametes.**
- **Female gametes are larger in size than the male gametes but are non-motile. The male gametes are motile.**
- **Puberty:- In humans , reproductive organs become functional only after attaining sexual maturity. This is attained at the age of 13- 14 years in males, and 10-11 years in females. The age of attaining sexual maturity is called puberty.**
- **Placenta:- From the outer most membrane of the embryo, a number of out pushings arise and get inserted into the inner wall of uterus of mother to form placenta. This device draws nutrition from the maternal blood.**
- **Umbilical cord:- It serves a link between the foetal and maternal circulation.**
- **Homeostasis:- One hormone accelerate the function of a particular organ, but the other hormone puts a brake on it. This system of opposing effects leads to a proper control and balance in the working of the organs. When there is too much of acceleration of the effect organ, the later sends a message back to the endocrine gland asking to stop secreting the hormone. This is a kind of feedback information, which serves to bring about a**

steady state or a stable state. This steady state of body function is called Homeostasis.

- **Semen: -It is a thick viscous fluid, which is ejaculated at the time of insemination. It contains sperm cells, secretion of seminal vesicles, prostate glands,Cowper's glands and urethral glands. In man the amount of semen discharged per ejaculation varies from 2.5 ml to 3.5 ml containing 200 – 600 millions of sperms and only one is needed for fertilization.**

- **Sperm:- It is a haploid cell in which 4 different parts can be recognized; Head, Neck, Middle piece, Tale. The head contains the haploid nucleus. The neck bears centriole. The middle piece has compact mitochondria. The tale beats in a characteristic manner so as to provide locomotion to the sperm as a whole.**

Cell division in animal- Cell division in animal is of following type-

Mitosis is a process of asexual reproduction in which the cell divides in two producing a replica, with an equal number of chromosomes in each resulting diploid cell.

Meiosis is a type of cellular reproduction in which the number of chromosomes are reduced by half through the separation of homologous chromosomes, producing two haploid cells.

Flower

A flower Consists of Following Parts-

- ***Calyx*- The sepals collectively are called as calyx. They are usually green in colour and protect the inner whorls of a flower especially during bud formation.**

- ***Corolla -* It consists of coloured petals. They are normally large often have fragrant and bright coloured. Their primary function is to attract animals and insects for pollination.**

- ***Stamen-*The stamens are referred as the male reproductive organ. A typical stamen is differentiated into three parts. They are filament, connective and anther.**

- ***Filament -*It forms the stalk that bears more or less cylindrical or avoid anther.**

- ***Connective* -It connects anther to filament.**

- ***Anther-*** **It is present on the top of filament. Each anther consists of two lobes that is why it is called bilobed.**

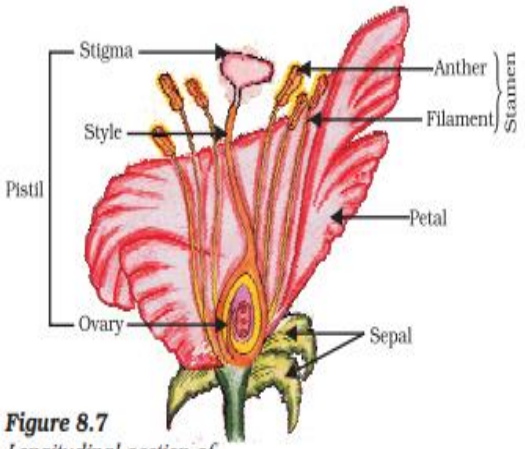


Figure 8.7
Longitudinal section of flower

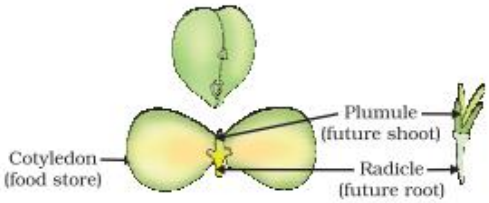


Figure 8.9
Germination

Pistil (female reproductive organ) -

- **It is located in the centre of a flower.**
- **It is composed of one or more carpals.**
- **The freely occurring units of the carpals in a flower are called pistils.**

Each pistil usually consist of three distinct parts - ovary, style and stigma.

- ***Ovary-*** **It is a basal, swollen part of the pistil The ovary has one or more chambers called loculi which is distributed in a special cushion like parechymatous tissue called the placenta, from which the ovule develops.**

- ***Style-*****From the top of the ovary arises a long, elongated structure called as style.**

- ***Stigma-*** **The terminal end of style is called as stigma. The stigma is normally rough, hairy or sticky to hold pollen grains during pollination process.**

REPRODUCTION IN A FLOWERING PLANT –

- **Pollen grains of a flower transfer to stigma of the carpel of the same flower (Self-Pollination) or to the carpel of the another flower (Cross-Pollination).**

- **This transfer of pollens is achieved by agent like wind, water or animals. After Pollination, the pollen grains reach to the egg cell in the form of a pollen tube.**

- **Fertilization- The fusion between the pollen grain and female egg cellis called fertilization. It occurs inside the ovary. Zygote is produced in this process.**

- **Zygote divides several times to form an embryo within the ovule. The ovule develops a tough coat and is converted into a seed.**

- **Ovary grows rapidly and ripens to forms a fruit, while the seed contains the future plant or embryo which develops into a seedling under suitable condition. This process is known as Germination.**

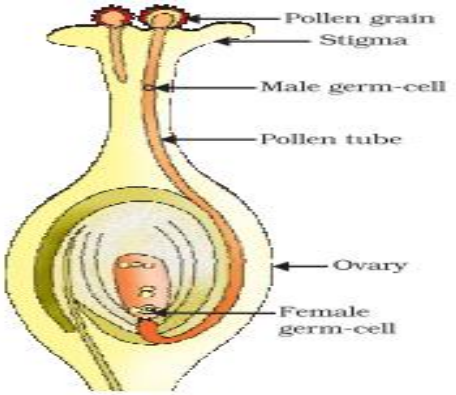


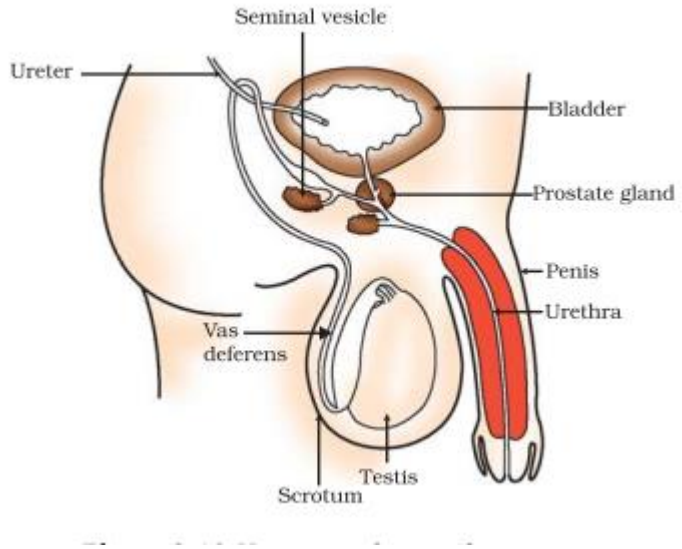
Figure 8.8
Germination of pollen on stigma

DIFFERENCES BETWEEN SELF POLLINATION AND CROSS POLLINATION

SR. no	*SELF POLINATION*	*CROSS POLINATION*
1	**Pollen grains are transferred from the anther to the stigma of the same flower**	**Pollen grains are transferred from the anther of one flower to the stigma of another flower borne on a different plant of the same species**
2	**Both the anther and stigma mature at the same time.**	**The anther and stigma of a flower generally mature at different times.**
3	**It can occur even when the flowers are Closed**	**It occurs only when the flowers are open**
4	**External agent is not required for self pollination.**	**An external agent abiotic or biotic, is essential for cross-pollination**
5	**In cannot eliminate useless or harmful characters.**	**It can eliminate useless or harmful characters.**
6	**Yield of the plant gradually falls with time.**	**Yield of the plant usually does not fall.**
7	**Self-pollination never helps in the production of new varieties and species.**	**Cross-pollination is a mechanism of producing new varieties and species among plants.**

Male Reproductive System –

• Male reproductive system comprises of following parts-
Testis, Scrotum , Epididymis ,Vas deference and Urethra



Testis- **They are soft, smooth, pinkish, oval organs. They are housed [present] in a sac like structure called as scrotum.**

Scrotum **- It is a pouch of pigmented skin arising from the lower abdominal wall and hanging between the legs. It lower the temperature by 2-2.5`C necessary for sperm formation.**

Epididymis **- They are long tubules which lie compacted along the testis from their upper ends to lower back side.**

*Vas deferenc***- They are thick walled and muscular and conduct sperms.**

*Urethra***- It arises from urinary bladder forming a urinogenital canal. It carries urine, sperm and secretion of seminal vesicles, prostrate gland.**

Penis - It is a male copulatory organ which also passes urine. It consists of highly sensitive covering of skin called prepuce.

FEMALE REPRODUCTIVE SYSTEM **-**

Female reproductive system comprises of following parts :
(i) Ovaries (ii) Fallopian tube (B) Uterus
(iv)Vagina

Ovaries- **These are oval shaped lying near the kidney.**
Ovary is covered by two layers outer is made up of germinal epithelial cells.

Fallopian tube - **It is about 10 cm. long muscular tube. It is used to carry ovum.**

Uterus - **It is large, highly elastic sac specialized for the development of the embryo. It is situated in a pelvic cavity.**

Cervix : **Lower narrow cervix that projects into the vagina. The cervix communicates above with the body of the uterus and below with the vagina.**

Vagina - **It is a large, median, elastic, muscular tube. It is also called a "Birth canal".**

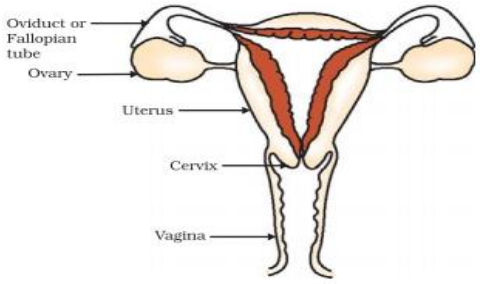


Figure 8.11 *Human–female reproductive system*

Menstrual Cycle-**It is a cyclic phase of the flow of blood with mucus and tissues etc. from the uterus of a woman at monthly interval.**

- **It occurs on average of 28 days interval.**
- **It starts at the age of 12-14 years and stops at 45-50 years of life.**
- **This cycle stops during pregnancy.**

Menopause-**The sexual cycle in a woman continues upto the age of 45 to 50 years. After that the ovary do not release egg. This stage is called Menopause. It a also marks the end of menstruation in the woman.**

Contraception : It is the avoidance of pregnancy. It can be achieved by

PHYSICALBARRIER- To prevent union of sperm & egg. Use of condoms ,Diaphragm & cervical caps.

SURGICAL METHOD- **There are following methods**

- ***Tubectomy*** **–It is done in females which involves cutting of fallopian tube.**
- ***Vasectomy-*** **It is done in males which involves cutting of vas deference from both the sides.**
- ***Ovariectomy*** **-Removal of ovaries surgically is called ovariectomy .**

CHEMICAL METHOD- **These includes certain jellies, paste, foam tables which when introduced into vagina cause immobilization of sperms and kill them. They also include contraceptive pils.**

SEXUALLY TRANSMITTED DISEASES- **STDs are communicated during unsafe sexual contact.They are of two types-**

VIRAL STDs - H.I.V. – AIDS

Bacterial STDs- Syphilis &Gonorrhoea