

12

Reproduction in Plants

Lesson at a Glance

- **Reproduction:** The process by which new individuals are produced is known as *reproduction*. Reproduction is one of the important life processes and is essential for the continuity of the species unlike other life processes, i.e., respiration, nutrition etc. Reproduction is not essential for the survival of an individual but it is very necessary for the perpetuation and preservation of the species. The reproduction increases the number of the members of a species and also preserves its kind.
- Most plants have roots, stems and leaves. These are called the *vegetative parts of plants*. The flowers are the sexual reproductive parts of plants.
- **Modes of Reproduction:** Different organisms reproduce in different ways but all these ways/modes of reproduction can be put into two general categories:
 - (a) Sexual reproduction and
 - (b) Asexual reproduction.
- In sexual reproduction of plants, male and female reproductive cells are involved. These female and male reproductive cells are collectively called *gametes*. In the process of sexual reproduction, a male and a female gamete fuse to form a single cell called *zygote*. This zygote gradually develops and grows into an adult similar to the parents. An individual which grows from a zygote, formed as a result of sexual reproduction, receives characters of both male and female.
- In asexual reproduction, sex cells (gametes) are not produced. Thus, no such fusion of gametes take place for the production of offsprings. In asexual reproduction, new plants are produced without production of seeds or spores.

• Various Modes of Asexual Reproduction in Plants:

- (i) Vegetative propagation (ii) Budding
- (iii) Fragmentation (iv) Spore formation

• **Vegetative Propagation:** It is the type of asexual reproduction in which new plants are produced from vegetative parts such as roots, stems, leaves and buds.

• Advantages of Vegetative Propagation:

- (i) It takes less time to grow and bear flowers and fruits than those produced from seeds.
- (ii) The new plants are exact copies of the parent plant as they are produced from a single parent.

• **Budding:** Plants, such as unicellular yeast plant, develop bulb like projections from the parent plant called *bud*. The bud grows and gets detached from the parent plant and forms a new plant.

• **Fragmentation:** Plants, like *spirogyra alga*, breaks up into two or more fragments or pieces. Each fragment grows into a new individual.

• **Sporangium:** The parts of plants, such as fungus like *Mucor/Rhizopus* and yeast, which produce through spore formation under favourable conditions are called *sporangium*.

• **Spore:** The *spores* are asexual reproductive bodies. For survival, each spore is covered with a protective coat to withstand unfavourable conditions such as high temperature and low humidity.

Under favourable conditions, a spore germinates into a new individual reproducing by means of spores.

• **Sexual Reproduction in Flowering Plants:** Flowers are the reproductive part of a plant. They help plants in sexual reproduction and producing fruits and seeds.

Generally, the third whorl of flowers consists of *stamens* (male sex organ) and the fourth whorl, the female sex organ, called *pistil*. A stamen consists of a swollen portion at the tip called *anther* and a long stalk called *filament*. Anther produces pollen grains which are male reproductive cells. A pistil consists of basal swollen portion called *ovary*. The

ovary contains one or more *ovules*. The female gamete or the egg is formed in an ovule.

- Most plants bear (hermaphrodite) bisexual flowers and some bear unisexual flowers. Sometimes a single plant bears both male and female flowers, e.g., maize.

In a bisexual flower, male reproductive cells (pollen grains) can reach to the female reproductive organ within the flower by touching each other.

- In unisexual flowers, some agencies are needed for carrying pollen grains from male flower to the female reproductive organs of the other flower. These agencies may be air, water current (in case of aquatic plants), insects, birds or other animals. The process by which pollen grains are transferred from stamens to the pistil (female sex organ) is called *pollination*.

- **Self-Pollination:** The transfer of pollen grains from the anther of a flower to the stigma of the same flower is called *self-pollination*. Generally, it occurs in bisexual flower.

- **Cross-Pollination:** The transfer of pollen from anther of a flower to the stigma of another flower of the same kind (species) is known as *cross-pollination*.

In cross-pollination, outside agencies such as air, insects, birds, are required to transfer pollen from anther of one flower to stigma of another flower.

Flowers which are pollinated through insects like honey bee, butterfly and birds, produce nectar, fragrance or are beautifully coloured to attract these animals. Thus, animals unknowingly carry out pollination for plants.

- When pollens are deposited on the stigma of the pistil, they germinate after some time. A long pollen tube develops from the pollen which passes through the tissues of style.

The pollen tube contains the sperm nucleus which remains at the tip of the tube. When pollen tube, after passing through style reaches ovule, the male gamete fuses with the egg (female gamete) and forms zygote.

- The process of fusion of sperm nucleus with that of egg nucleus is called *fertilization*. After fertilization, the ovary develops into a fruit and the ovules form the seeds.

- **Hyphae:** The plant body of a fungus, except the unicellular forms, is commonly made of an interwoven mass of very fine and delicate threads, called *Hyphae*, collectively called *Mycelium*. They do not contain chlorophyll.
- **Dispersal:** The distribution of fruits and seeds far and wide from their parents is called *dispersal*. The seeds which are light, small or have tufts of silky hair on their body are carried away to distant places by the wind.
- Seed dispersal is carried out by agencies like air, water, birds and other animals including man.

• **Benefits of seed dispersal:**

- (i) It avoids over crowding of young plants around their parent plants. Over crowding could lead to severe competition for sunlight, water, minerals and space. As a result seedlings would not grow into healthy plants.
- (ii) It prevents competition between the plant and its own seedlings for sunlight, water and minerals.
- (iii) It also enables the plants to invade new habitats for wider distribution and provides better chances of survival.

■ TEXTBOOK QUESTIONS SOLVED ■

Q.1. Fill in the blanks:

- (a) Production of new individuals from the vegetative part of parent is called _____.
- (b) A flower may have either male or female reproductive parts. Such a flower is called _____.
- (c) The transfer of pollen grains from the anther to the stigma of the same or of another flower of the same kind is known as _____.
- (d) The fusion of male and female gametes is termed as _____.
- (e) Seed dispersal takes place by means of _____ and _____.

- Ans.** (a) vegetative reproduction (b) unisexual flower
(c) pollination (d) fertilization
(e) wind, water

Q.2. Describe the different methods of asexual reproduction. Give examples.

Ans. Different methods of asexual reproduction are:

- Binary Fission:** This process takes place in unicellular organisms. Parent cell elongates and gets divided into two identical daughter cells. Each daughter cell grows into an independent adult.
- Endospore Formation:** In this method the spore wall is formed around a bacterial cell to form an endospore. This endospore germinates to form an active bacterium under favourable conditions.
- Fragmentation:** In this process, body of the organism breaks up into two parts. Then each part grows into a new filament thus forming two organisms from a single one.
- Spore Formation:** The spores are tiny spherical unicellular structures protected by thick wall. The spores are stored in a hard outer covering and this is called sporangium. Under favourable conditions the hard cover breaks and spores spread for germination.
- Budding:** In yeast, new organisms are produced by the bud formation from the parent organism. After growing to full size, the bud gets detached and forms a new independent individual.
- Vegetative propagation:** When vegetative parts of a plant like stems, leaves and root etc., give rise to new ones, it is called vegetative propagation.

Q.3. Explain what you understand by sexual reproduction.

Ans. Sexual reproduction means involvement of two parents in the process of reproduction. It is found mainly in higher plants where male gamete and female gamete fuse to form a zygote. These zygotes develop into individuals which are not identical. Offsprings inherit the characteristics of both the parents. In sexual reproduction both parents survive after the process of reproduction.

Q.4. State the main differences between asexual and sexual reproduction.

Ans.

Asexual reproduction	Sexual reproduction
(a) Only one parent plant is involved.	(a) Both male and female parents are involved.
(b) Occurs in unisexual plants.	(b) Occurs in bisexual plants.
(c) Occurs in lower plants.	(c) Occurs in higher plants.
(d) Reproductive organs are not present.	(d) Fully developed reproductive parts are present.
(e) In most of the methods the process of reproduction.	(e) Original parents remain alive after original parent disappears.
(f) Process like gamete formation or zygote.	(f) Fertilization of gametes give rises to fertilization is not seen.
(g) Characteristics of only one parent is inherited.	(g) Characteristics of both parents are inherited.
(h) No need of seeds.	(h) Seeds are used to get new plants from a flower.

Q.5. Sketch the reproductive parts of a flower.

Ans.

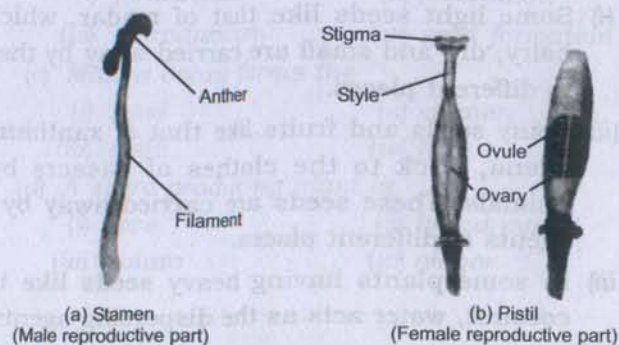


Fig. 12.1

Q.6. Explain the difference between self-pollination and cross-pollination.

Ans.	Self-Pollination	Cross-Pollination
	(a) Pollen grains are transferred to the stigma of the same flower.	Pollen grains are carried to stigma of another flower.
	(b) Occurs in bisexual plants having anther and stigma maturing at same time.	Occurs in bisexual flowers having anther and stigma maturing at different times.
	(c) It takes place in plants like wheat, peas etc.	It takes place in plants like lady-finger, tomato, brinjal etc.

Q.7. How does the process of fertilization take place in flowers?

Ans. When the pollen grain reaches the stigma of a same species flower, it starts growing out into the pollen tube of the stigma. This tube continues to grow inside the style till it reaches the ovule. Male cells are released into the ovule for the fertilization with the female egg cell and thus the zygote is formed. After this process of fertilization, the ovary develops into fruit and ovule into seeds.

Q.8. Describe the various ways by which seeds are dispersed.

Ans. Following are the ways in which the seeds are dispersed:

- Some light seeds like that of madar, which are hairy, dry and small are carried away by the wind to different places.
- Spiny seeds and fruits like that of xanthium and urena, stick to the clothes of passers by and animals. These seeds are carried away by these agents to different places.
- In some plants having heavy seeds like that of coconut, water acts as the dispersing agents.

(iv) Some seeds are dispersed with the fruit burst like in case of balsam and castor.

Q.9. Match items in Column I with those in Column II:

Column I	Column II
(a) Bud	(i) Maple
(b) Eyes	(ii) Spirogyra
(c) Fragmentation	(iii) Yeast
(d) Wings	(iv) Bread mould
(e) Spores	(v) Potato
	(vi) Rose

Column I	Column II
(a) Bud	(iii) Yeast
(b) Eyes	(v) Potato
(c) Fragmentation	(ii) Spirogyra
(d) Wings	(i) Maple
(e) Spores	(iv) Bread mould

Q.10. Tick (✓) the correct answer:

(a) The reproductive part of a plant is the

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|------------|-------------|
| (i) leaf | (ii) stem |
| (iii) root | (iv) flower |

(b) The process of fusion of the male and the female gametes is called

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|--------------------|---------------------|
| (i) fertilisation | (ii) pollination |
| (iii) reproduction | (iv) seed formation |

(c) Mature ovary forms the

- | | |
|--------------|-------------|
| (i) seed | (ii) stamen |
| (iii) pistil | (iv) fruit |

(d) A spore producing plant is

- | | |
|--------------|------------------|
| (i) rose | (ii) bread mould |
| (iii) potato | (iv) ginger |

(e) *Bryophyllum* can be reproduced by its

- (i) stem (ii) leaves
(iii) roots (iv) flower

- Ans.** (a) (iv) flower (b) (i) fertilisation
(c) (iv) fruit (d) (ii) bread mould
(e) (ii) leaves

EXTENDED LEARNING — ACTIVITIES AND PROJECTS

Q.1. Make your own cactus garden by collecting pieces cut from different kinds of cacti. Grow the variety in one single flat container or in separate pots.

Ans. Students make the cactus garden themselves.

Q.2. Visit a fruit market and collect as many local fruits as possible. If many fruits are not available, you can collect tomatoes and cucumbers (these are fruits, though we use them as vegetables). Make drawings of the different fruits. Split the fruits and examine the seeds within. Look for any special characteristics in the fruits and their seeds. If possible visit the website:

www.saps.plantsci.com.ac.uk/fscfruit/dispersal.pdf
You can visit a library also to learn about this.

Ans. Students collect the fruits and study the characteristics of fruits and seeds themselves.

Q.3. Think of ten different fruit-bearing plants. Remember that many vegetables are also fruits of the plants. Discuss with your teacher, parents, farmers, fruit growers and agricultural experts (if available nearby) and find out the manner of their dispersal. Present your data in the form of a table as shown below:

S. No.	Name of fruit bearing plant	Agent through which seeds are dispersed	Part of or seed which helps in dispersal
1.			
2.			
3.			

Ans.

S. No.	Name of fruit bearing plant	Agent through which seeds are dispersed	Part of or seed which helps in dispersal
1.	Coconut	Water	Fibrous coating
2.	Lotus	Water	Thalamus which floats in water
3.	Balsam	Sudden jerks	Bursting pericarp
4.	Banyan	Birds	Stick to the beak of birds
5.	Orchid	Wind	Lightness, minute
6.	Cotton	Wind	Hair on seeds
7.	Silk	Wind	Hair on seeds
8.	Tecoma	Wind	Winged seeds
9.	Oxalis	Animal	Barbs/hooks
10.	Tiger's nail	Animals	Seeds have hooks

Q.4. Suppose there is one member of a particular kind of organism in a culture dish, which doubles itself in one hour through asexual reproduction. Work out the number of members of that kind of organism which will be present in the culture dish after ten hours. Such a colony of individuals arising from one parent is called a "clone".

Ans. The number of organisms becomes twice the initial count in one hour through asexual reproduction.
Number of organisms in

$$\begin{array}{ll}
 1 \text{ hour} = 1 \times 2 = 2 & 6 \text{ hours} = 32 \times 2 = 64 \\
 2 \text{ hours} = 2 \times 2 = 4 & 7 \text{ hours} = 64 \times 2 = 128 \\
 3 \text{ hours} = 4 \times 2 = 8 & 8 \text{ hours} = 128 \times 2 = 256 \\
 4 \text{ hours} = 8 \times 2 = 16 & 9 \text{ hours} = 256 \times 2 = 512 \\
 5 \text{ hours} = 16 \times 2 = 32 & 10 \text{ hours} = 512 \times 2 = \mathbf{1024}
 \end{array}$$