Chapter 6

Reproduction in Plants

Points to Study:

6.1 Reproduction and its types
6.2 Pollination
6.3 Fertilization
6.4 Heredity

6.1 Reproduction and its types

You must have eaten mango from a mango tree, guava from a guava tree and ripened fruit of a neem tree. After eating mango you might have sown its seed in the soil and tried to take care of it.

In your surrounding, you might have observed a neem tree growing from neem seed , a maize plant developing from maize seed and similarly a goat giving birth to a kid and a cow giving birth to a calf.

Have you ever wondered that :

- Why onlyneem plants develop under a neem tree?
- Why a goat gives birth to on of its kind?
- Why do this happen?
- If this doesn't happen, then what will happen?

Every organism, whether a plant or an animal, who has taken birth on this earth, has to die. So to maintain the continuity of its species, every living being produces an offspring of its type. The process to produce offspring of its own type is called Reproduction. This process goes on from generation after generation so as to maintain the continuity of their species.

Types of reproduction in plants are as follows:

1. Vegetative reproduction
2. Asexual reproduction
3. Sexual Reproduction
4. Parthenogenesis

1. Vegetative reproduction

Activity 1

Take a potato and observe it carefully. In its grooves, there are some outgrowths called the 'eyes of potato'. Cut the potato into parts, containing these

eyes, and sow these parts in the pits dug in the soil. Cover the pits with soil and water it regularly. After a few days take out these potato pieces by digging the soil.

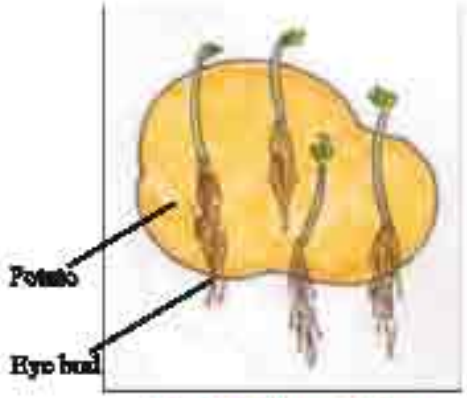

Fig 6.1 Vegetative reproduction in Potato

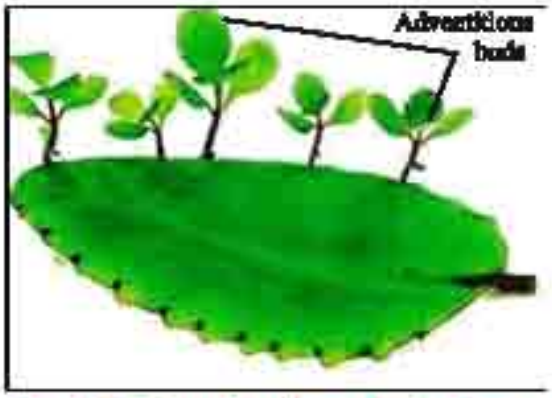

Fig 6.2 Germinating plants from Bryophyllum leaves

Observation : New plants germinating from the eyes are observed.

The process of development of a new plant from any vegetative part of a plant other than the seed is called vegetative reproduction . The plants developed by vegetative reproduction are identical to their parent plant. These are called **Clones.** Example: potato, grass, onion, colocasia ginger, jasmine etc.

Similarly, buds are present in the grooves of Bryophyllum (Phathurchata) leaves. The leaves containing these buds, when fell onto the moist soil, each bud develops into a new plant. In Cactus, the stem when separated from plant, gives rise to a new plant and in Dahlia, the roots give rise to a new plant.

Activity - 2

Cut a branch of Rose plant at its node. Node is that part of the plant from where the leaves arises.10-12 cm long this part of stem is called stock. Cut it in a slanting manner, grow it in soil and water it regularly.

Observation

- How many days does it take for new branches to appear?

This will gradually develop into a new plant.

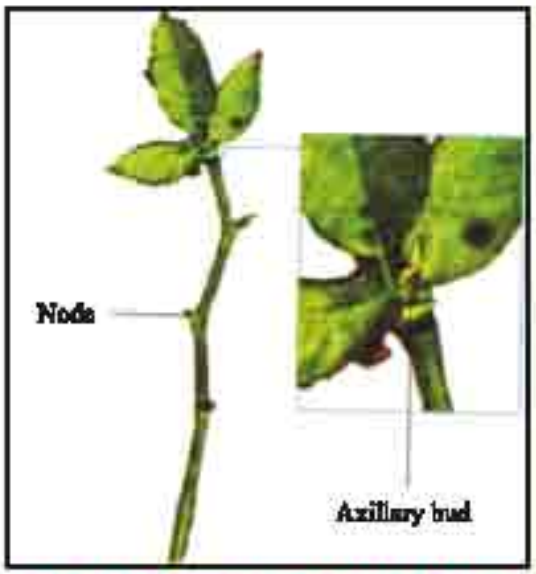

Fig.6.3 Germinating stem of rose

Benefits of vegetative reproduction :

1. Plants develop in lesser time.
2. Flowers and fruits are obtained in lesser time.
3. The new plants are obtained from a single parent.
4. Parental characters are conserved as the plants grown are genetically identical.

2. Asexual reproduction

In this process a single parent is involved. In this type of reproduction, there is no fusion of gametes and the chromosomal number remains constant. Asexual reproduction takes place by following processes.

Budding

Activity - 3

Bring yeast powder or yeast cake from your near by bakery shop. Add a pinch of yeast in a bowl containing water. Add 1 teaspoon full of sugar and mix. Now keep this bowl in a warm place.

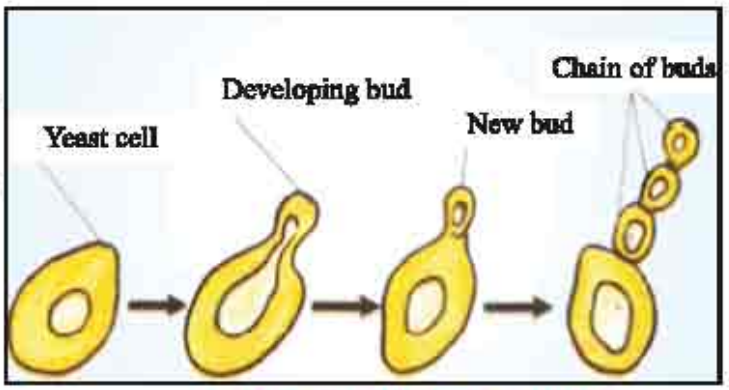

Fig 6.4 Budding in yeast

Observation : After an hour, take a drop of this liquid on a glass slide and observe under a microscope. You will see new yeast cells as shown in fig 6.4. Buds are formed in yeast cells as a small bulb. Gradually the bud grows and when it gets separated from the parent, new yeast cells are formed.

Fragmentation

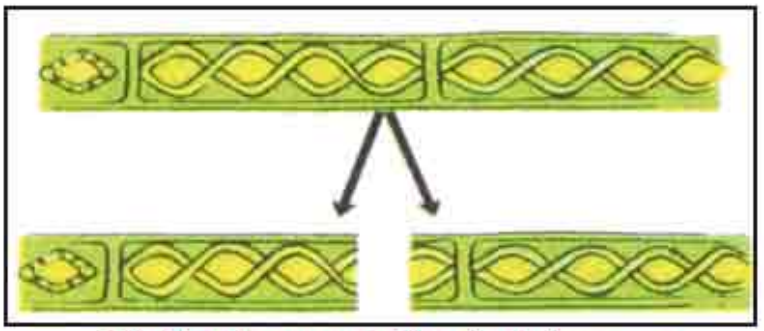

Fig 6.5 Fragmentation in Spirogyra

You might have observed a green slippery growth in ponds or stagnant water. These are called algae. In favourable conditions, algae grow speadily by fragmentation and each fragment forms a new alga. Example: Spirogyra

Spore Formation : If pieces of bread are kept in moist place, then after sometime cotton like fungal growth is seen.

In this cotton like fungi, black and brown coloured sporangia containing spores are seen. When these spores are released, in air, being light in weight, they are spread at far away places. Each spore at unfavourable conditions, like high temperature and low moisture, makes a hard coating around itself. In favourable conditions the spores germinate and forms new fungal filaments (Hyphae). Example: Mucor, Rhizopus

This type of reproduction takes place generally in lower groups of organisms like algae, fungi, moss and fern.

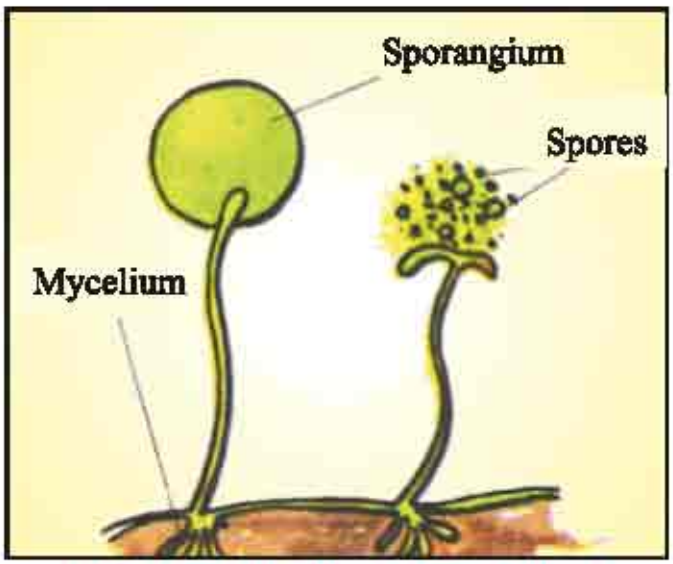

Fig. 6.6 Spore formation in Mucor

3. Sexual Reproduction

Activity 4

Take a Dhatura flower. Try to identify its different structures. Paste it on a different parts on a chart sheet and try to label them with the help of your teacher. The outermost whorl, made up of green leaf like structures is called calyx and its each member is called sepal. Inside calyx is a another beautiful whorl of white leaves which is called corolla. Each member is called a petal. Both of these whorls are called accessory whorls. They help the flower in reproduction process. Observe the flower and fill in the following table.

Table 6.1 Description about various parts of Dhatura flower.

Sr. No.	Name of structure	Number	Colour	Function
1.	Calyx			
2.	Corolla			
3.	Androceium			
4.	Gynoceium			

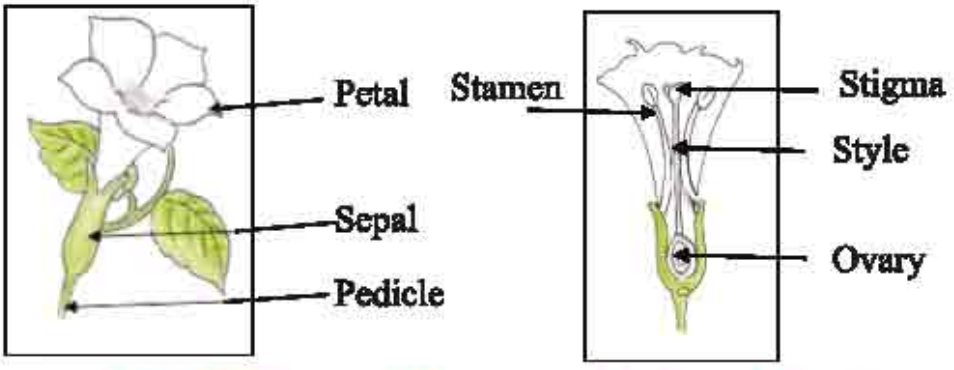

Fig 6.7 Flower of Dhatura and its internal section

Inside the corolla, is present the reroductive parts of a flower. Androecium is the male reproductive organ while gynoecium is the female reproductive organ.

Unisexual flowers : The flowers in which either androceium or gynoceium is present are called unisexual flowers. Example: papaya , maize, etc

Bisexual flowers : The flowers in which both androceium and gynoceium are present are called bisexual flowers. Example: mustard, Rose, Pitunia, Dhatura etc. The Androecium has pollen sacs in which a large number of pollen grains are formed. Male nuclie are formed by the germination of pollen grains.

The gynoecium has stigma, style and ovary. Ovary has one to many ovules in it. Female gamete or egg are formed in the ovule.

6.2 Pollination

Being light in weight, pollens reach from one place to another by the means of water, air, insects and animals. The pollens get stick to the body of insects, when they sit in the flower. When these insects sit on the another flower, these pollens fall on the stigma of the flower. Transfer of the pollen

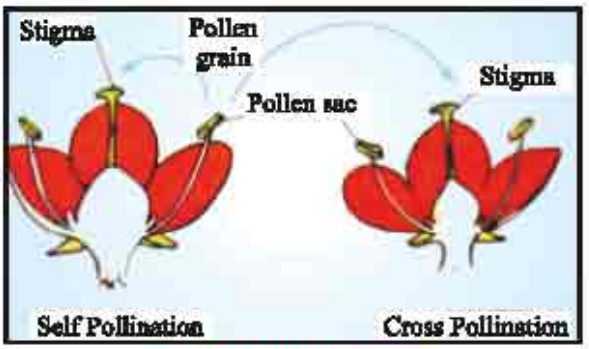

Fig 6.8 Pollination

grains from the pollen sacs to the stigma of a flower by any means of agent is called pollination.

Self pollination : Transfer of pollens from the anther to the stigma of the same flower or to the stigma of another flower of the same plant is called self pollination. Example:Pea , Tomato, Cucumber.

Cross pollination : Transfer of pollens from the anther to the stigma of flower of another plant of same species is called cross pollination.

Example:Rose, poppy.

6.3 Fertilization

By pollination, the pollens reach the stigma of gynoecium and gets germinated. A pollen tube arises from the pollen and reaches the ovule in the ovary, through the style. The male nuclei present in the pollen tube fuses with the egg cell present in the ovule. Thus the process of fusion of male nucleus and female nucleus is called fertilization. Fertilization results in the diploid zygote. This zygote further divides to form an embryo. Thus after fertilization, seed develops from the ovule and fruit develops from the ovary. When the fruit is used up, the seeds become free and germinates to form a new plant. The process to produce offsprings in this manner in the developed plants (angiosperm) is called sexual reproduction. In angiosperms, the endosperm is triploid.

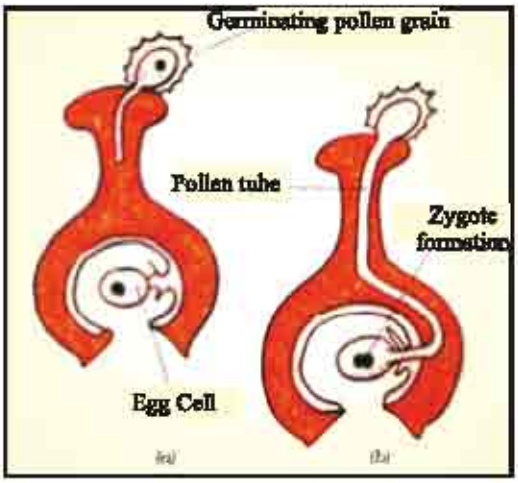

Fig 6.9 Fertilization

Development of fruit and seed

After fertilization, seed from the ovule and fruit from the ovary are developed. An embryo is present in the seed , which is responsible for formation of a new plant.

Also know this:

Largest flower	-	Rafflesia
Smallest flower	-	Wolfia
Largest seed	-	Lodoesia
Smallest seed	-	Orchid

Do all the fruits have seeds?

Which fruits do not have seeds?

Fruit: A fruit is formed in the ovary or a mature ovary is called fruit.

The wall of the ovary forms the wall of the fruit. Fruits are mainly of two types:

1) True fruit 2) False fruit

1) **True fruit** : The fruits which develop only from the ovary are called true fruits.

2) **False fruits:** Sometimes floral parts, other than the ovary, like thalamus, calyx etc. also contributes to fruit formation. Such fruits are called false fruits. For example, in apple and pear thalamus contributes to fruit formation. Thus apple and pear are false fruit.

Parthenocarpy

When the ovary directly develops into fruit without fertilization, this is called parthenocarpy. Fruits develop in such a way do not contain seeds. Example: banana, grapes etc.

All the fruits are divided into 3 classes:

1) Simple fruit 2) Aggregate fruit 3) Composite fruit

1) **Simple fruit:** When a single fruit develops from the ovary of a flower, it is called single fruit. Example- mango, wheat etc.

2) **Aggeregate fruit:** When many fruits develop from pollycarpellary and apocarpous gynoecium but remain as a group, they are called Aggregate fruit. Example- strawberry

3) **Composite fruit:** When all the flowers of an entire inflorescene participates in fruit formation, it is called Composite fruit. Example- Mullberry, Custard apple.

6.4 Heredity

You learnt that, seed gives rise to a similar plant and the animals give birth to the similar offsprings. Parental or hereditary characters are transferred from generations to generation in such offsprings.

This process of transfer of herditary characters from one ganeration another generation is called heredity.

Gregor John Mendel, for the first time, experiments of herdity on various characters of a pea plant. For his contribution in the field of genatics, Mendel is known as the father of genetics. Table 6.2 shows the list of contrasting traits of pea plant studied by Mendel.

Table 6.2 : List of contrasting pair of traits

Sr. No.	Characters	Contrasting traits
1.	Stem height	Tall/ dwarf
2.	Flower colour	Purple/ white
3.	Flower position	Axial / terminal
4.	Shape of the pod	Inflated/constricted
5.	Pod colour	Green/ yellow
6.	Shape of the seed	Round/ wrinkled
7.	Seed colour	Yellow/ green

Mendel called the carriers of these seven pairs of contrasting traits as factors. Now a days we call them genes. Why Mendel selected pea plant only for his experiments of heredity?

Let us try to find out

1) Seven clearly visible contrasting traits.
2) Short life span of pea.
3) Generally self pollination takes place in pea but if required cross pollination can be easily carried out.

Based on his observations of experiments of heredity on pea plant, Mendel formulated following three laws of inheritance:

1) Law of Dominance
2) Law of Segregation
3) Law of Independent Assortment

You will study Mendel's experiments and above mentioned laws in detail in higher classes.

What have you learnt

- All the organisms reproduces to maintain their existence.
- In plant reproduction takes place by vegetative, asexual and sexual mode.
- Vegetative parts like leaf, stem and root produce new plant in vegetative reproduction.
- Vegetative and asexual reproduction takes place in lower classes of plants.
- Sexual reproduction takes place in higher classes of plants in which male and female gametes fuse.
- In the flower of unisexual plant, male and female flowers are found separately. Male flower has only male reproductive organs and female flower has only female reproductive organs.
- Bisexual flower has both male and female reproductive organs.
- Pollination is of two types- self-pollination and cross pollination.
- Pollination can be carried out by air, water, insects and other animals.
- An Embryo is developed from a zygote.

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EXERCISES

Mark the correct option:

1. Vegetative reproduction is found in -
   a) Potato b) Wheat
   c) Neem d) Pea ( )
2. Fusion of male and female gametes is called-
   a) Pollination b) Fertilization
   c) Budding d) Spore ( )
3. Unisexual flower is-
   a) Maize b) Mustard
   c) Rose d) Petunia ( )

4. Bisexual flower is-

a) Papaya b) Maize

c) Cucumber d) Mustard ( )

Fill in the blanks:

1. Fern and moss reproduces by _____
2. To produce _____ of their own kind is called _____
3. _____ is formed by the fusion of male and female gametes.
4. In _____ pollens from the anthers reaches the stigma of the same flower.

Match the following:

A	B
1) Fragmentation	1) Mustard
2) Budding	2) Banana
3) Parthenogenesis	3) Yeast
4) Sexual Reproduction	4) Spirogyra

Short- answer type question:

1. Describe the various processes of asexual reproduction. Give example of each.
2. Differentiate between unisexual and bisexual flower.
3. Differentiate between self pollination and cross pollination.
4. Draw a labelled diagram of of a flower.
5. Explain parthenocarpy with an example.
6. Write the 3 laws of inheritance given by mendel.

Long answer type questions

1. Differentiate between sexual and asexual reproduction.
2. Explain process of sexual reproduction with diagram.
3. Explain the various processes of vegetative reproduction with examples.

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