

5

Reproduction in Plants

We'll cover the following key points:

- The structure of a plant
- Asexual Reproduction in Plants
- Sexual Reproduction in Plants
- Seed Structure and Its Germination
- Seed Dispersal



Hi, I'm EeeBee

Do you Remember:

Fundamental concept in previous class.

In class 3rd we learnt

- Structure of Seed.
- Germination.

Still curious?
Talk to me by
scanning
the QR code.



Learning Outcomes

By the end of this chapter, students will be able to:

- Understand the concept of reproduction in plants and its importance for the continuation of plant species.
- Identify and differentiate between various modes of reproduction in plants, such as seeds, spores, and vegetative propagation.
- Explore examples of plants that reproduce through seeds (e.g., mango, apple), spores (e.g., ferns, mosses), and vegetative propagation (e.g., potato, rose).
- Learn how factors like pollination, seed dispersal, and germination contribute to the reproduction process in plants.

Guidelines for Teachers

The teacher can start the chapter by introducing the concept of reproduction in plants, encouraging students to observe plants in their surroundings and identify different parts involved in reproduction. Discussions can focus on the different modes of reproduction, such as seeds, spores, and vegetative propagation, and their significance. The teacher can emphasize the role of pollination, seed dispersal, and germination in the plant life cycle, helping students understand how plants reproduce and contribute to the ecosystem.



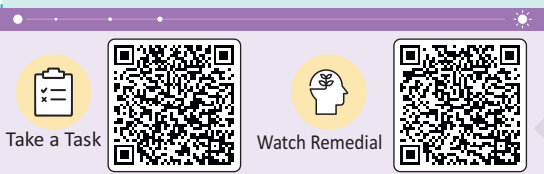
Warm Up

Unscramble the following words to make meaningful words.

1. BRMEOY : _____
2. ESSDE : _____
3. IADRCLE : _____
4. RTGOWH : _____
5. PROC : _____

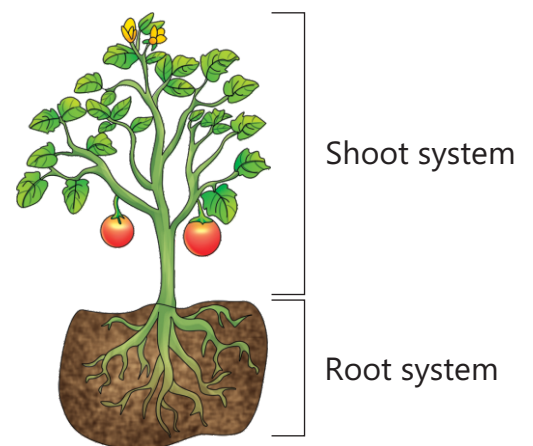
Fun Fact

Plants have fascinating ways to reproduce! Some, like dandelions, spread seeds using wind, while coconuts travel by floating on water to reach new lands. Plants like strawberries can reproduce by sending out runners, creating clones of themselves. The world's largest flower, the Rafflesia, uses a stinky smell to attract insects for pollination. Some plants, like peas, are self-pollinating, ensuring survival even without external help!



The structure of a plant

We see a variety of plants around us. Though these plants vary in shape and size, they show some basic common features. A typical plant may be broadly divided into two main parts. The part below the ground (root system) and the part above the ground (shoot system) are comprised of the stem, leaf, flower and fruit.



Did you know ?

1. An average sized tree can provide enough wood to make 170,100 pencils!
2. The tallest tree ever was an Australian eucalyptus–In 1872 it was measured at 435 feet tall!
3. The evaporation from a large oak or beech tree is from ten to twenty-five gallons in twenty-four hours!
4. The California redwood (coast redwood and giant sequoia) are the



Baobab Tree

tallest and largest living organisms in the world!

5. The baobab tree found in Africa can store 1,000 to 120,000 litres of water in its swollen trunk!
6. The Elephant grass found in Africa is named so as it is 4.5 meters high and even elephants can hide in it!

Types of reproduction in plants

Reproduction is the process by which living organisms such as plants and animals produce young ones of their own kind. A flower is the reproductive part of a plant. It may contain the male reproductive part (stamen) or the female reproductive part (carpel or pistil) or both. Although most flowering plants reproduce through seeds, reproduction in plants may be of two types.

Asexual reproduction and Sexual reproduction.

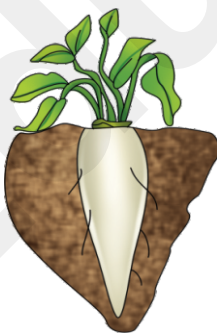
Asexual Reproduction in Plants

It is the type of reproduction which does not involve the reproductive parts of the plant.

Vegetative Propagation: It is the type of asexual reproduction in which a new plant is produced from a vegetative part of the parent plant such as root, stem or leaf.

Roots: In plants such as carrots, turnips and sweet potatoes, the roots may become swollen with food. Buds present at the base of the old stem above the root give rise to a new plant.

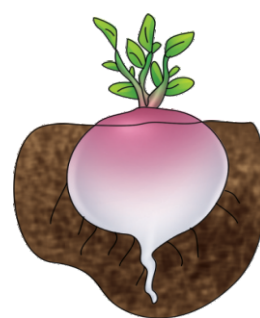
Stems: Underground stems of certain plants such as onion (bulb), ginger (rhizome) and potato (tuber) give rise to new plants. A potato has special structures called 'eyes'. These give rise to buds that may grow into a new plant. Onion bulbs store excess food and may give rise to a new plant. The rhizome of ginger has scale leaves, where buds arise that may give rise to new plants.



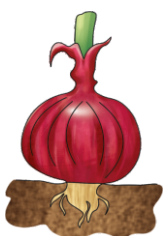
Radish



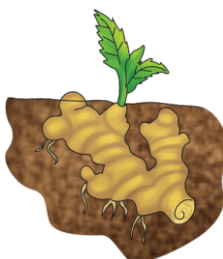
Carrot



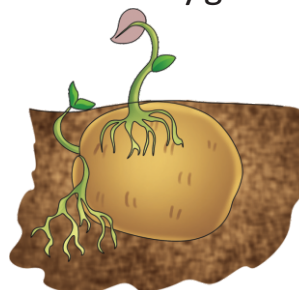
Turnip



Onion (bulb)



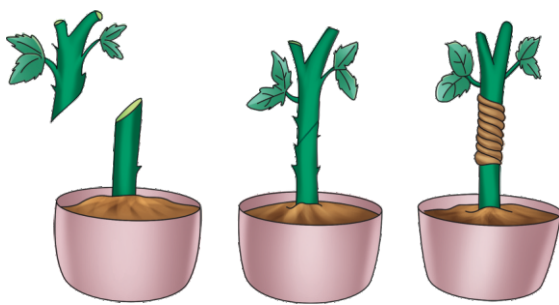
Ginger (rhizome)



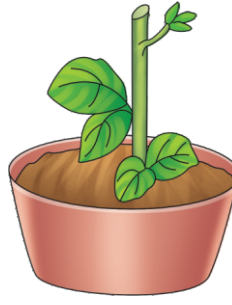
Potato (tuber)



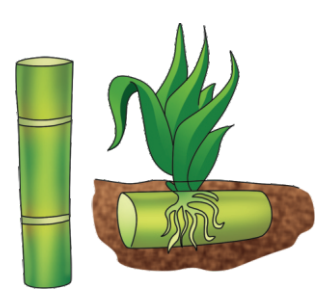
Also plants such as rose, jasmine and sugarcane may give rise to new plants through stem cuttings.



Rose plant stem cutting

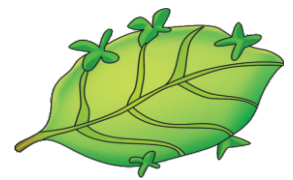


Jasmine plant stem cutting



Sugarcane plant stem cutting

Leaves: In plants such as Bryophyllum, new plants are produced from leaves that have buds along their margins. These buds may give rise to new plants when they detach from the parent leaf.

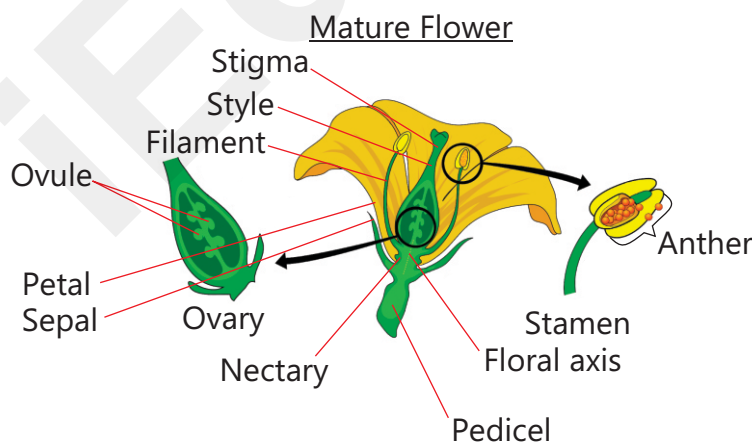


Bryophyllum leaf

Spore and cone formation: Apart from the above mentioned methods, plants like mushrooms, moulds, ferns and mosses reproduce by spore formation. Spores are special reproductive structures. Trees like pines have reproductive structures called cones.

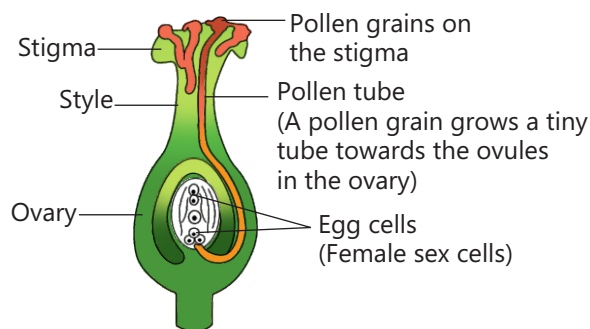
Sexual Reproduction in Plants

It is the type of reproduction that involves the fusion of male and female gametes (reproductive cells). The process of sexual reproduction in plants starts with the transfer of pollen grains from the anther to the stigma (of the same or different flower). The process of pollination has been discussed in the previous chapter



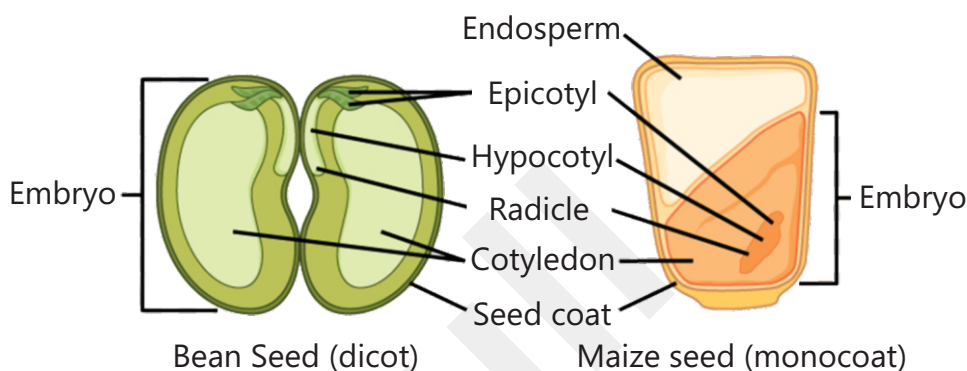
Fertilization: Once a pollen grain falls from the anther to the stigma of a similar plant, it might start to germinate due to the presence of a sticky substance present in the stigma. The pollen grain on the stigma then grows into a long pollen tube which carries the male reproductive cell (or gamete) through the long style into the ovary. Inside the ovary lies the ovules (or female gamete). The male gamete now combines with the female gamete to produce a Zygote which later gives rise to a baby plant through seed (seedling).

Fertilization is the process in sexual reproduction by which the male and the female gametes fuse together to produce a zygote.



Fruit and seed formation:

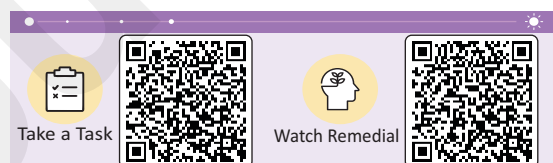
After fertilization, all parts of the flower except the ovary dry and fall off. The ovary changes into the fruit tissue and the ovules change into seeds. The seeds give rise to baby plants.



Seed Structure and Its Germination

Seed Structure

A seed is a small embryonic plant. The outer covering of the seed is called the seed coat that protects the tiny plant from insects, disease and damage. The small pore outside the seed through which air and water enters is the micropyle. The part that will grow into root is the radicle which grows first and the part that will grow into shoot is the plumule. Seeds usually have one or two seed leaves or cotyledons which store food for the growing embryo. A seed having one cotyledon is called monocot and one having two cotyledons is called dicot.



Activity

Creative Learning

- Soak maize and bean seeds overnight.
- Carefully remove the seed coat from the seeds.
- Closely examine the seeds.
- Observe the micropyle, plumule, radicle and cotyledons in the seeds.
- The students may record their observations in the following tabular format:

Seeds	Seed coat (if seen)	No. of cotyledons	Radicle (if seen and function)	Plumule (if seen and function)	Micropyle (if seen and function)
Bean					
Maize					

Write 'T' for true and 'F' for false statements.

1. Flower is a reproductive part of a plant.
2. Onion bulbs store excess food and may give rise to a new plant.
3. Trees like pines have reproductive structure called cones.
4. A seed having one cotyledon is called dicot.

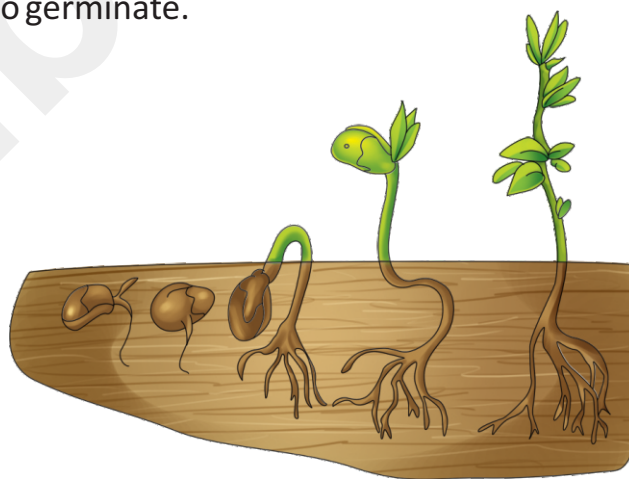
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Germination of Seeds

The growth of a seed into a young plant or a seedling is called **germination**. For a seed to germinate or grow into a baby plant, it needs the following conditions:

- ✦ **Water** - helps the seed to swell up so that the embryo can start growing.
- ✦ **Warmth** - speeds up and improves the process of germination.
- ✦ **Air (oxygen)** - releases energy for the embryo to germinate.

When the conditions are right, the seed starts to take in water, swells, and the seed coat splits apart. Air gets in, burns the packed food inside and releases energy for the baby plant to grow. A tiny root grows downwards whereas a shoot begins to grow upwards. Tiny leaves sprout at the end of the shoot that start making food. At this stage, it is called the seedling. Finally the seed shrinks and disappears. More and more leaves grow and the stem becomes thicker and stronger. The plant then produces flowers and seeds and the process continues.



Germination of Seeds

Did you know ?

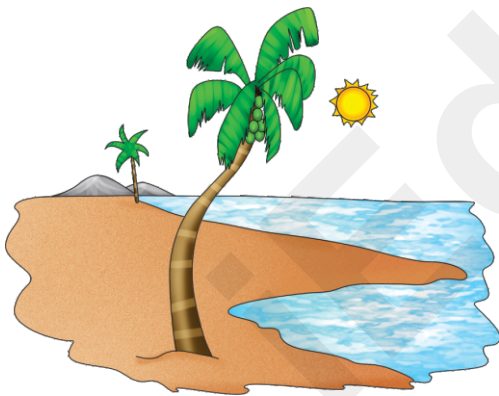
A Russian team discovered some seeds of *Silene stenophylla*, a flowering plant native to Siberia that had been buried by an Ice Age squirrel. Radiocarbon dating confirmed that the seeds were 32,000 years old. They placed them in vials, and germinated the plants which grew, flowered, and after a year, created seeds of their own.

Seed Dispersal

The movement or transport of seeds away from the parent plant is called seed dispersal.

Need for seed dispersal: Dispersal of seeds is very important for the proper growth and development of both the parent plant and the new saplings. If the seeds fall just onto the ground below the parent plant, they might not get enough sun, water or nutrients from the soil. This would result in competition among them for these resources. Ultimately they would die. Dispersal also helps plants to grow in new geographical areas. Therefore, plants have developed various ways to disperse their seeds. Let us study a few ways of seed dispersal.

Dispersal by wind: Seeds from plants like dandelions and cottonwood trees are light and have feathery bristles and can be carried long distances by the wind. Some plants, like kauri and maple trees, have 'winged' seeds. They don't float away but flutter to the ground. Wind dispersed seeds have to be produced in large numbers so that at least some may grow.



Coconut being transported by water

Dispersal by animals: Animals and human beings throw away seeds after eating the fruits at different places thus helping in seed dispersal. Animals and birds get attracted by the bright colour and nutrient rich flesh of fruits. They then disperse the seeds by defecation or by spitting them out. Some seeds develop hooks and spines that get tangled in animals hair or fur and are carried to new locations.



Dispersal by water: Seeds of plants that grow near or on water bodies are dispersed by water. For example, lotus and coconut seeds are dispersed by water. In the case of coconuts, their waterproof and fibrous wooden casings allow them to be transported to extremely long distances in saltwater.



Take a Task



Watch Remedial

Did you know ?

The largest seed in the plant kingdom comes from the coco-de-mer palm, native to the Seychelles Archipelago in the Indian Ocean about 1,000 miles East of Kenya. The coco-de-mer seed weighs up to 18kg but can float and is dispersed by water.



Dispersal by explosion: In some plants such as pea pods and lady's fingers, seeds are dispersed through an explosion mechanism. The seed pods slowly dry out in the sun creating pressure inside the pod. The pod bursts open when the pressure inside is great enough, thus projecting the seeds away from the plant.



In a Nutshell

- ✦ A typical plant may be broadly divided into root and shoot systems.
- ✦ Reproduction in plants may be either asexual or sexual.
- ✦ In asexual reproduction, also known as vegetative propagation, a new plant arises from parts such as roots, stems or leaves.
- ✦ In sexual reproduction, the male and the female reproductive cells(gametes) fuse to form a zygote which later gives rise to a baby plant through seed.
- ✦ A seed comprises structures such as seed coat, micropyle, plumule, radicle and cotyledons.
- ✦ A seed requires water, warmth and air (oxygen) to germinate and give rise to a seedling.
- ✦ Dispersal of seeds is very important for the proper growth and development of the parent plants and the saplings.
- ✦ The various agents of seed dispersal are air, water, animals and explosion.



Key Words

Improving Vocabulary

Vegetative propagation	: Reproduction from plant parts such as roots, stems, leaves, spores and cones.
Zygote	: It is the fertilized egg that gives rise to a baby plant.
Defecation	: The act of passing the contents of bowels out of the body.
Seedling	: A baby plant



EXERCISE

That turn curiosity into confidence—let's begin!



Gap Analyzer™
Take a Test

A. Objective Type Questions.

1. Seeds of Dandelion and maple trees are most likely to be dispersed by:
a. Animals ☐ b. Wind ☐
c. Water ☐ d. Explosion ☐
2. The transport of seeds away from the parent plant is called
a. Fertilization ☐ b. Germination ☐
c. Seed dispersal ☐ d. Reproduction. ☐
3. The part of the seed that grows into shoot is called:
a. Plumule ☐ b. Radicle ☐
c. Micropyle ☐ d. Cotyledon. ☐
4. For germination, a seed requires:
a. Water ☐ b. Air ☐
c. Warmth ☐ d. All of these ☐
5. Most flowering plants reproduce through:
a. Roots ☐ b. Stem ☐
c. Seeds ☐ d. Spores ☐
6. Which of the following reproduce through stems?
a. Potato ☐ b. Bryophyllum ☐
c. Mosses ☐ d. Sweet potato ☐
7. Sneha was gathering lady's fingers in the field. She saw some of the dried lady's fingers bursting open and the seeds being flung out. In what way does bursting of the lady fingers help the plant?
a. Less water is needed for plants when seeds are spread ☐
b. The seeds are spread far away and can grow better ☐
c. Farmers do not need to plant seeds again ☐
d. Birds can find the seeds easily for food ☐

B. Fill in the blanks :

1. Mushrooms, moulds and mosses reproduce by _____.
2. In plants like pea and lady's finger, seeds are dispersed by _____.
3. During germination, the _____ grows into root and _____ grows into shoot.
4. In _____ new plant is produced from leaves.

C. Very Short Answer Questions.

Name them.

1. A small pore outside the seed through which air and water enter _____.
2. Maize and rice are examples of this type of seed. _____.
3. Carrot, radish, turnip are modifications of this part of a plant. _____.
4. A monocot leaf has this type of arrangement of veins. _____.
5. Male and female gametes (reproductive cells) combine to form this. _____.

D. Short Answer Questions.

1. What is reproduction? Name the reproductive part of a plant.
2. What are the two main parts of a typical plant? Explain with a labelled diagram.
3. What is fertilization? What changes occur after fertilization?
4. What do you mean by vegetative propagation? Give two examples of plants that reproduce vegetatively.
5. What is seed dispersal? Why is it necessary?

E. Long Answer Questions.

1. Explain with examples the different modes of seed dispersal.
2. With the help of a neat, labelled diagram describe the process of fertilization in plants.
3. Define germination. What are the conditions required for a seed to germinate? Describe the process with the help of a suitable diagram.
4. With the help of a neat labelled diagram describe the structure of a seed.
5. Describe briefly the various processes of vegetative propagation in plants.



Custom Learning Path

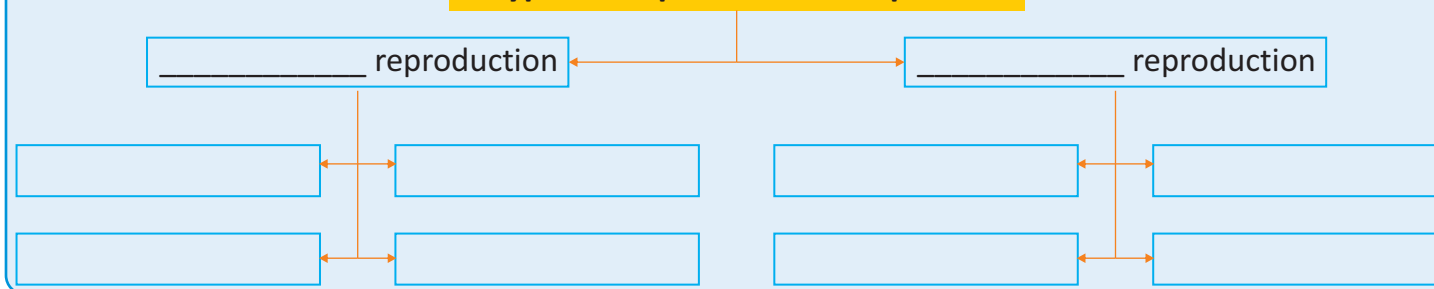


Time to Recall

Remembering and Analysing

Recall and complete the concept map given below.

Types of reproductions in plants



Time to Apply

Applying and Creating

1. Tara and Tina buried some money plant leaves in the soil. However, there are no signs of a new plant peeping out of the soil. What do you think went wrong?
2. Silk and wool are two animal fibres. Will it be wrong to admit that we are able to get them because of plants only?



Time to Observe

Observing, Critical Thinking, Analysing

All flowering plants are classified as either a monocot (one cotyledon), or a dicot (two cotyledons). There are other differences between a monocot and a dicot, most notably the leaf structure. In a monocot, the leaf veins are paralleled, like a blade of grass. In a dicot, the leaf veins are netted like a peepal leaf.

Using the information given above, separate the following seeds into monocot or dicot:

Onion, carrot, tomato, beans, rice, wheat, peas, cauliflower, garlic, grasses, pepper, corn
(Hint- try to recollect the type of leaves of each seed, whether parallel or net like.)

MONOCOT SEEDS		DICOT SEEDS	



Time to Discuss

Pondering and Communicating

Simran planted rose leaves in a pot to grow a rose plant. Do you think she would be able to grow it?



Time to Create

Creating and Collaborating

Soak a bowl of bean seeds in water for a day. Observe the tiny seedling growing and draw a diagram of a seed. These seedlings are rich in digestible energy, vitamins and minerals. You can have these seeds for breakfast with a pinch of salt and drops of lemon. Find out what these seeds are called.