Seed Structure and Germination

Seed Structure:

A seed is a small embryonic plant enclosed in a protective outer covering. It contains all the necessary components for the plant's growth.

Parts of a Seed:

i. Seed Coat:

The outer protective covering of the seed.

Protects the seed from insects, disease, and damage.

It prevents the seed from drying out.

ii. Micropyle:

A small pore on the seed coat.

Allows air and water to enter the seed during germination.

iii. Radicle:

The embryonic root of the seed.

It is the first part to emerge during germination.

Grows downwards into the soil and develops into the primary root.

iv. Plumule:

The embryonic shoot of the seed.

It grows upwards and forms the stem and leaves.

v. Cotyledons:

Seed leaves that store food for the growing embryo.

Provide nutrients until the seedling can produce its own food through photosynthesis.

Seeds can have:

- One cotyledon → Monocot (e.g., maize, wheat, rice).
- Two cotyledons → Dicot (e.g., bean, pea, sunflower).

Difference Between Monocot and Dicot Seeds:

Feature	Monocot Seed	Dicot Seed
Number of cotyledons	One	Two
Example	Maize, wheat, rice	Bean, pea, sunflower
Leaf venation	Parallel venation	Reticulate venation
Root system	Fibrous roots	Taproot system
Flower parts	Multiples of three (3, 6)	Multiples of four or five
Vascular bundles	Scattered	Arranged in a ring

Activity: Observing Seed Structure

i. Materials Needed:

- Maize seeds (monocot)
- Bean seeds (dicot)
- Water
- Tweezers

ii. Steps:

- Soak the seeds overnight in water.
- Carefully remove the seed coat using tweezers.
- Examine the internal parts of the seed.
- Identify the micropyle, radicle, plumule, and cotyledons.
- Record observations in a table.

Observation Table:

Seed Type	Seed Coat (if seen)	Number of Cotyledons	Radicle (if seen and function)	Plumule (if seen and function)	Micropyle (if seen and function)
Bean (Dicot)	Present	Two	Becomes the root	Becomes the shoot	Entry point for water and air
Maize (Monocot)	Present	One	Becomes the root	Becomes the shoot	Entry point for water and air

Germination of Seeds:

Germination is the process by which a seed develops into a young plant (seedling).

Conditions Required for Germination:

i. Water:

Helps the seed to swell and soften the seed coat.

Activates enzymes that convert stored food into energy.

ii. Warmth:

Speeds up and improves the germination process.

Seeds need an optimal temperature range (around 25-30°C for most plants).

iii. Air (Oxygen):

Essential for cellular respiration, which releases energy for growth.

Seeds need oxygen to break down food reserves and release energy.

Process of Germination:

i. Water Absorption:

The seed absorbs water through the micropyle.

The seed swells and the seed coat splits open.

ii. Radicle Emergence:

The radicle (root) emerges first.

It grows downward into the soil and anchors the plant.

iii. Plumule Growth:

The plumule (shoot) grows upwards.

Tiny leaves begin to sprout, starting the process of photosynthesis.

iv. Seedling Development:

The plant forms more leaves and the stem thickens.

The seed shrinks and disappears as the plant becomes independent.

Types of Germination:

i. Epigeal Germination:

The cotyledons come above the soil during germination.

Example: Beans, sunflower.

ii. Hypogeal Germination:

The cotyledons remain below the soil.

Example: Maize, pea.

Fun Fact: Ancient Seeds Germination

A Russian team discovered seeds of Silene stenophylla, a flowering plant native to Siberia, that had been buried by an Ice Age squirrel.

The seeds were 32,000 years old.

They germinated, flowered, and produced seeds of their own, demonstrating the incredible longevity of some seeds.

Importance of Seed Germination

i. Plant Propagation:

Germination allows the growth of new plants from seeds.

Ensures the continuation of plant species.

ii. Crop Production:

Farmers rely on germination for the cultivation of crops.

Successful germination ensures higher yields.

iii. Ecological Balance:

Germination maintains the plant population and contributes to oxygen production.

iv. Food Chain Stability:

Germination supports the growth of plants, which serve as food for herbivores, maintaining the food chain.

Key Takeaways

A seed contains the embryonic plant with vital parts: seed coat, micropyle, radicle, plumule, and cotyledons.

Germination is the process of seed growth into a seedling.

Water, warmth, and air are essential for germination.

The radicle grows downward, forming the root, while the plumule grows upward, forming the shoot.

Monocots have one cotyledon, while dicots have two cotyledons.

Germination is essential for plant propagation, crop production, and ecological balance.