3/12/26 Seed- Structure

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Ch-6 Pollination and Germination

Notes:

1. What is Seed, Fruit and Grain

A fruit is the enlarged, ripened ovary formed after fertilisation. The fruit wall encloses and protects the seeds, and also helps in seed dispersal.
Examples: Mango, pea pod.

A seed is a mature ovule formed after fertilisation. It contains a living plant called the embryo, which develops into a new plant during germination. The seed coat protects the embryo from injury and infection.
Examples: Bean, castor, pea.

A grain is actually a single-seeded fruit in which the fruit wall and seed coat are fused together to form a protective covering.
Examples: Maize, wheat.

2. General Structure of a Seed

Every seed has the following main parts:
1. Seed coat - outer protective covering.
2. Embryo - the baby plant.
3. Food storage tissue - cotyledons or endosperm.

The embryo consists of:
- Radicle - future root.
- Plumule - future shoot.
- Cotyledons - seed leaves storing food.

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In dry seeds, the embryo remains inactive, a condition called dormancy. Under favourable conditions, it becomes active and germinates.

3. Classification of Seeds

(A) Based on number of cotyledons

1. Monocotyledonous seeds
Seeds having only one cotyledon.
Examples: Maize, rice, wheat.
2. Dicotyledonous seeds
Seeds having two cotyledon.
Examples: Bean, gram, pea.

(B) Based on presence of endosperm

1. Albuminous seeds
Seeds in which endosperm persists and stores food.
Examples: Maize, cereals.
2. Exalbuminous seeds
Seeds in which endosperm is absent, and food is stored in cotyledons.
Examples: Bean, pea, gram.

4. Structure of a Dicot Seed

A bean seed is kidney-shaped and flattened.
External features:
- Testa - outer hard seed coat.
- Tegmen - inner thin seed coat.
- Hilum - whitish scar showing point of attachement to ovary.
- Micropyle - small pore near hilum.

Functions of micropyle:
- Allows absorption of water during germination.
- Helps in exchange of respiratory gases.

Internal Structure:
- Two thick cotyledons containing stored food.
- Embryo present between cotyledons.

The embryo has:
- Radicle - forming the root.
- Plumule forming the shoot.
- Hypocotyl - region below cotyledons.
- Epicotyl - region below cotyledons.

5. Structure of a monocot seed - Maize Grain

The maize grain is a monocotyledonous and albuminous seed.

Some points:
- It is a single-seeded fruit.
- Fruit wall and seed coat are fused.
- Large endosperm stores food, mainly starch.
- The outer layer of endosperm rich in protein is called aleurone layer.

Embryo features:
- A single cotyledon called scutellum (a modified cotyledon that absorbs food from the endosperm and supplies it to the Embryo).
- The radicle is protected by coleorhiza (a protective sheath covering the radicle).
- The plumule is protected by coleoptile (a protective sheath covering the plumule).

6. Germination

Germination is the process by which the embryo develops into a seedling into a seedling under suitable conditions.

In a dry seed:
- Embryo is in dormant state.
- Respiration occurs very slowly.
- Heat and carbon dioxide are released in small amounts.

Before germination, the seed must undergo physiological maturation

7. Conditions Necessary for Germination

(i) Water
- Activates enzymes.
- Softens seed coat.
- Helps conversion of stored food into soluble form.
- Absorbed mainly through micropyle.

(ii) Oxygen
- Required for respiration.
- Supplies energy for growth of embryo.

(iii) Suitable temperature
- Both very low and very high temperatures inhibit germination.
- Optimum ~~temperature~~ temperature (about 25°C - 35°C) is favourable.

Seeds sown very deep fail to germinate due to:
- lack of oxygen.
- Insufficient pushing force of embryonic parts.

8. Experiment Related to Germination
Several simple experiment prove the conditions necessary for germination

(A) Experiment to prove that water is necessary for germination
Two beakers are taken and labelled A and B.
In beaker A, seeds of gram are placed on wet cotton wool.
In beaker B, similar seeds are placed on dry cotton wool.
Both beaker A germinate, while seeds in beaker B do not germinate.
Observation:
Seeds in beaker A germinate, while seeds in beaker B do not germinate.
Conclusion: Water is essential for germination as it activates enzymes and help in swelling of the seed.

(B) Experiment to prove that a suitable temperature is necessary
Two beakers A and B are taken.
Seeds are placed on wet cotton wool in both beakers.
Beaker A is kept at room temperature.
Beaker B is kept in a refrigerator.
Observation: Seeds in beaker A germinate while seeds in beaker B do not germinate
Conclusion: A suitable temperature ~~prevents~~ is necessary for germination. Very low temperature prevents germination.

(C) Experiment to prove that oxygen (air) is necessary for germination.
Two cotton plasks A and B are taken.
Wet cotton wool and soaked gram seeds are placed in both flasks.
In flask B, a small test tube containing alkaline pyrogallol is suspended.
Alkaline pyrogallol absorbs oxygen.
Flask A is kept as control.
Observation: Seeds in flask A germinate.
Seeds in flask B do not germinate.
Conclusion: Oxygen is necessary for respiration during germination.

(D) Experiment Three-bean seed experiment
Three soaked bean seeds are tied to a glass slide.
The slide is placed in a beaker containing water such that.
- The top seed is above water.
- The middle seed is just at water level.
- The bottom seed is fully submerged.

Observation: Only the middle seed germinates.
Conclusion: Germination requires both water and oxygen.
The top seed gets oxygen but no water.
The bottom seed gets water but very little oxygen.

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9. Types of germination

(A) Hypogeal germination
- Epicotyl elongates.
- Cotyledons remain underground.
- Example: Pea, maize.

(B) Epigeal germination
- Hypocotyl elongates.
- Cotyledons come above the ground.
- Example: Bean, castor.

(C) Viviparous germination
- Seed germinates inside the fruit while attached to parent plant.
- Seen in mangrove plants.
- Example: Rhizophora.

10. The Seedling

Germination ends with the formation of a seedling.
- Roots absorb water and minerals.
- Leaves start photosynthesis.
- The plant becomes independent and grows into a mature plant.

Notes

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