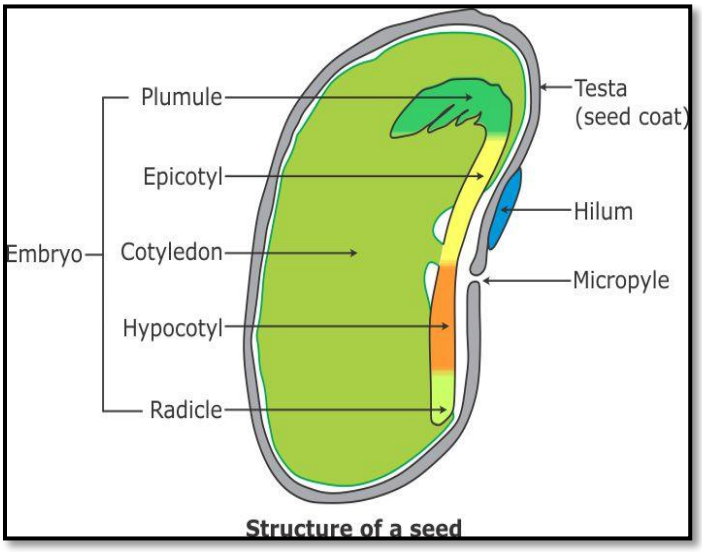
Seeds – Structure and Germination

- The **fruit** is an enlarged, matured or ripened ovary. It protects the seed and helps in seed dispersal. Examples: Mango, pea pod etc.

- The **seed** is a mature and ripened ovule of a flower which is formed after fertilisation. It stores food material for the nourishment of the embryo during germination. The seed coat protects the embryo from mechanical damage. Examples: Bean, pea etc.

- **Grain** is actually a fruit in which the fruit wall and the seed coat are fused together to form a protective layer. Examples: Maize, wheat etc.



Structure of a seed

- **Monocotyledonous seeds:** Consist of only one cotyledon. Examples: Maize, grass etc.

- **Dicotyledonous seeds:** Consist of two cotyledons. Examples: Pea, gram, bean etc.

- **Small seeds:** Very tiny and not visible to the naked eye. Examples: Poppy, orchid etc.

- **Large seeds:** Bigger and easily visible to the naked eye. Examples: Watermelon, pumpkin, mango etc.

- **Largest seeds:** Biggest and double the size of large seeds. Examples: Coconut, double coconut etc.

- **Albuminous/endospermic seeds:** The endosperm is large, thick and fleshy. It serves as the food source for the developing embryo.
  Dicot albuminous seeds: Poppy, custard apple, muskmelon, fenugreek etc.
  Monocot albuminous seeds: Cereals, millets, palm, onion etc.

- **Exalbuminous/non-endospermic seeds:** The cotyledons store food and become thick and fleshy.
  Dicot exalbuminous seeds: Gram, pea, mango, mustard, soya bean etc.
  Monocot exalbuminous seeds: Orchid, *Amorphophallus*, *Vallisneria* etc.

Differences between Bean seed and Maize grain

PARTS	BEAN SEED	MAIZE GRAIN
• Cotyledons	Two	One
• Endosperm	Absent	Large
• Embryo	Large	Small
• Plumule leaves	Folded	Rolled
• Plumule	Large	Very small
• Hilum	Visible	Not visible
• Micropyle	Visible	Not visible
• Seed arrangement	Separate, contained in fruit called pod	No separate seed. Seed wall and fruit wall are fused to form a single grain.

- The process in which the embryo emerges out of the seed by rupturing the seed coat, leading to the formation of a seedling is called **germination**.

- **Conditions necessary for Germination:**
  1. **Water**: When water enters the seed, it activates the enzymes present in the seed. These enzymes mobilise the reserve food and break it into simpler forms. This food is utilised by the embryo, and the embryo begins to grow.
  2. **Temperature**: A moderate temperature, ranging from 25°C to 35°C is favourable for the seeds to germinate. Such a temperature is known as optimum temperature.
  3. **Oxygen**: Oxygen provides energy through respiration for rapid cell division and cell growth.
  4. **Light**: Seeds of plants do not germinate unless they are exposed to a certain duration of light.

- **Types of Germination**

TYPE	CHARACTERISTICS	EXAMPLES
Hypogeal germination	• The epicotyl elongates and the cotyledons remain underground.	Pea, gram, maize, wheat **etc.**
Epigeal germination	• The hypocotyl elongates and the cotyledons are pushed above the ground.	Bean, castor, sunflower, gourd **etc.**
Viviparous germination	• The seed germinates while it is still inside the fruit, attached to the mother plant.	*Rhizophora*, *Sonneratia*

- The **seedling** is a stage in plant growth where the plant is still dependent on the reserve food of the seed or the food manufactured by the cotyledons.

- The seedling consists of five parts—the radicle or embryonic root, hypocotyl, epicotyl, plumule and cotyledons.