

Pre-Lab Module: Plant Embryogenesis & Seed Development

Introduction to Plant Embryogenesis

Plant embryogenesis is the process by which a single-celled zygote develops into a mature embryo within a seed. This process establishes the basic body plan of the plant and prepares the embryo for dormancy and subsequent germination.

Key Developmental Stages

Zygote Stage: The fertilized egg cell that results from the fusion of male and female gametes.

Globular Stage: Early stage where the embryo forms a spherical mass of cells through rapid cell division.

Heart Stage: Characterized by the formation of cotyledon primordia, giving the embryo a heart-shaped appearance.

Torpedo Stage: The embryo elongates and begins to differentiate various tissue types.

Mature Embryo Stage: Fully developed embryo with distinct organs, ready for dormancy.

Seed Components and Their Functions

Essential Seed Structures:

- **Cotyledons:** Seed leaves that store nutrients or aid in photosynthesis
- **Epicotyl:** Develops into the shoot system
- **Hypocotyl:** Connects cotyledons to radicle
- **Radicle:** Embryonic root
- **Endosperm:** Nutrient tissue (in albuminous seeds)

Monocot vs. Dicot Comparison

Dicot Embryos (e.g., Bean):

- Two cotyledons
- Food storage in cotyledons
- No endosperm at maturity (exalbuminous)

Monocot Embryos (e.g., Corn):

- Single cotyledon (scutellum)
- Food storage in endosperm
- Endosperm present at maturity (albuminous)
- Coleoptile and coleorhiza protective sheaths

Biological Significance

Seed development represents a crucial adaptation in plant evolution, allowing for:

- Dispersal to new habitats
- Survival during unfavorable conditions
- Protection of the embryonic plant
- Efficient nutrient storage

Plant Embryo Development Sequence

[Zygote] → [Globular Stage] → [Heart Stage] → [Torpedo Stage] → [Mature Embryo]

Each stage represents progressive differentiation and organization of embryonic tissues

Preparation for Lab Activities

Before proceeding to the virtual investigation, ensure you understand:

1. The sequence of embryo development stages
2. Key differences between monocot and dicot embryos
3. Functions of major seed components

4. The role of dormancy in plant life cycles

Complete the pre-lab quiz to test your understanding of these concepts.

GBIO 100 - Developmental Biology Laboratory

Laboratory Exercise No. 4: Plant Embryogenesis & Seed Development