



# Training in organic breeding

Module 15: **Hot Water Treatments for Seed Health**

Unit 15.1: **Seedborne and seed-transmitted  
pathogens**

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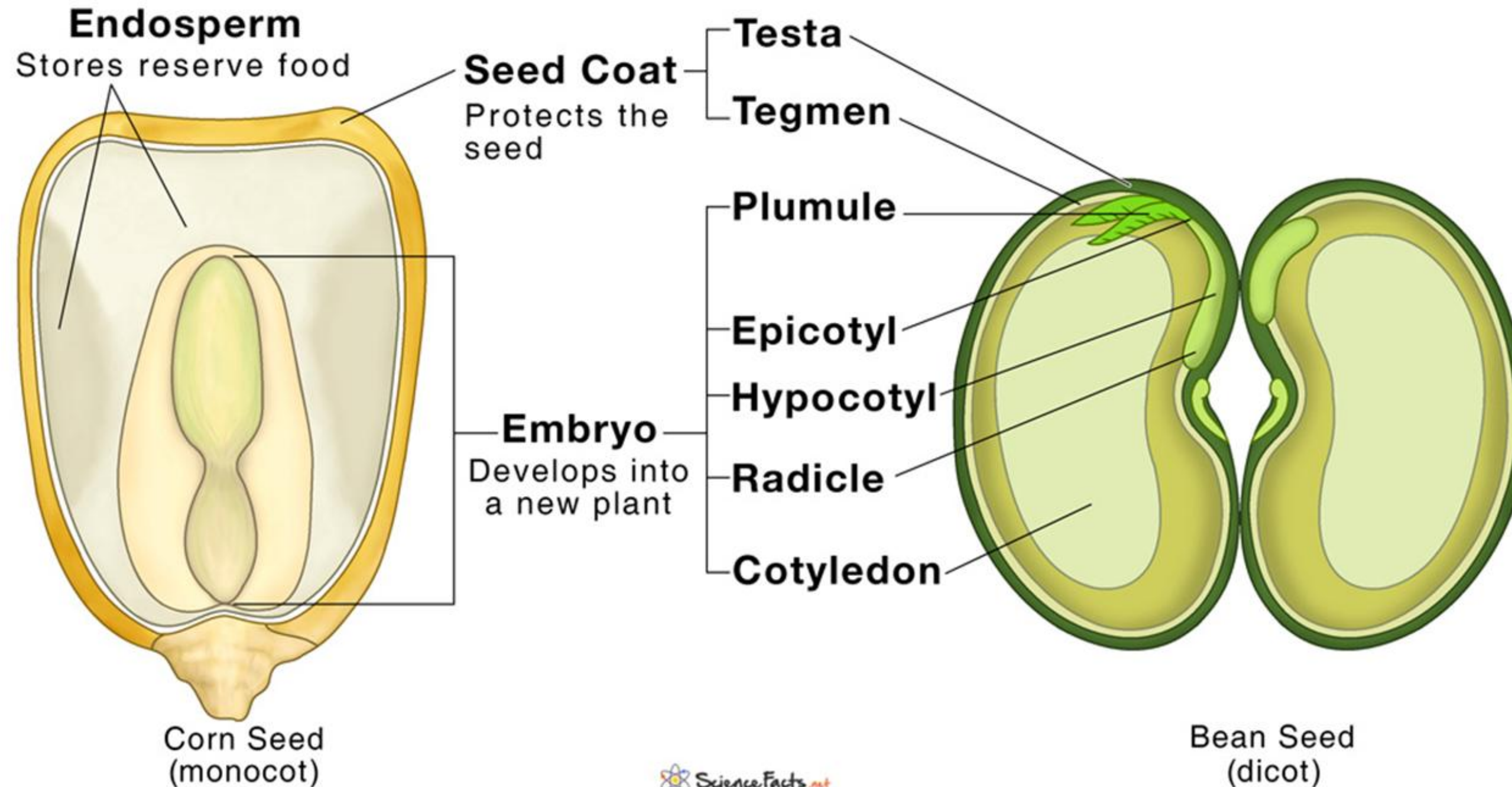
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UK Research  
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# Parts of a Seed with Functions



# Seedborne vs Seedtransmitted

- **Seedborne pathogens** – carried by seeds (externally or internally) that may or may not be transmitted to plants grown out of those seeds causing disease
- **Seed transmitted pathogens** – transmitted directly to plant growing out of infected seed, causing the disease

# Contamination vs Infection

- **Contamination** – presence of pathogen on the seed surface
- **Infection** – pathogen is inside the seed, endosperm or embryo

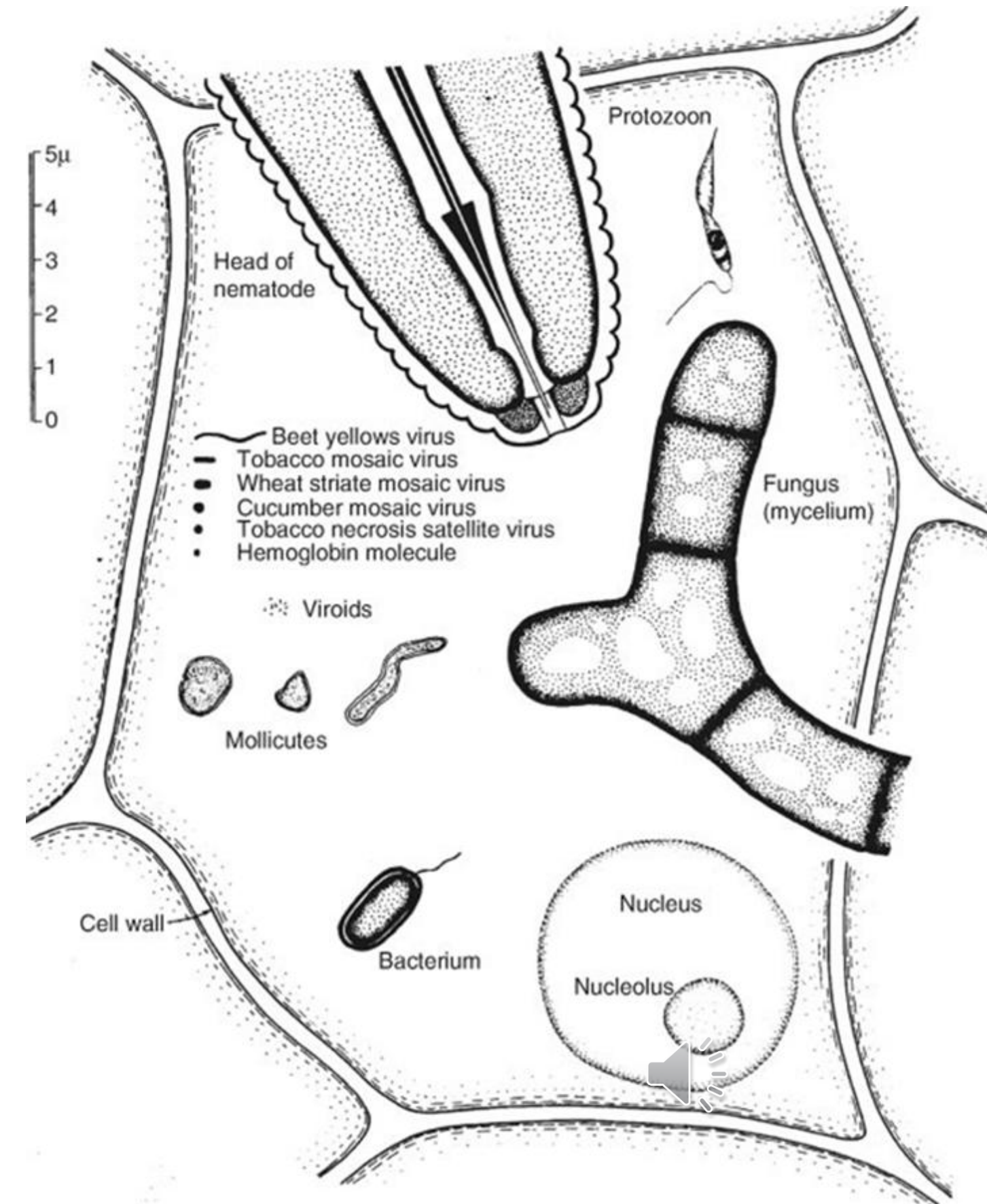
# Significance of seedborne diseases

- 1. Loss of germination and vigor**
- 2. Yield reduction**
- 3. Reduction of marketable yield**
- 4. Reduction in shelf life, etc.**

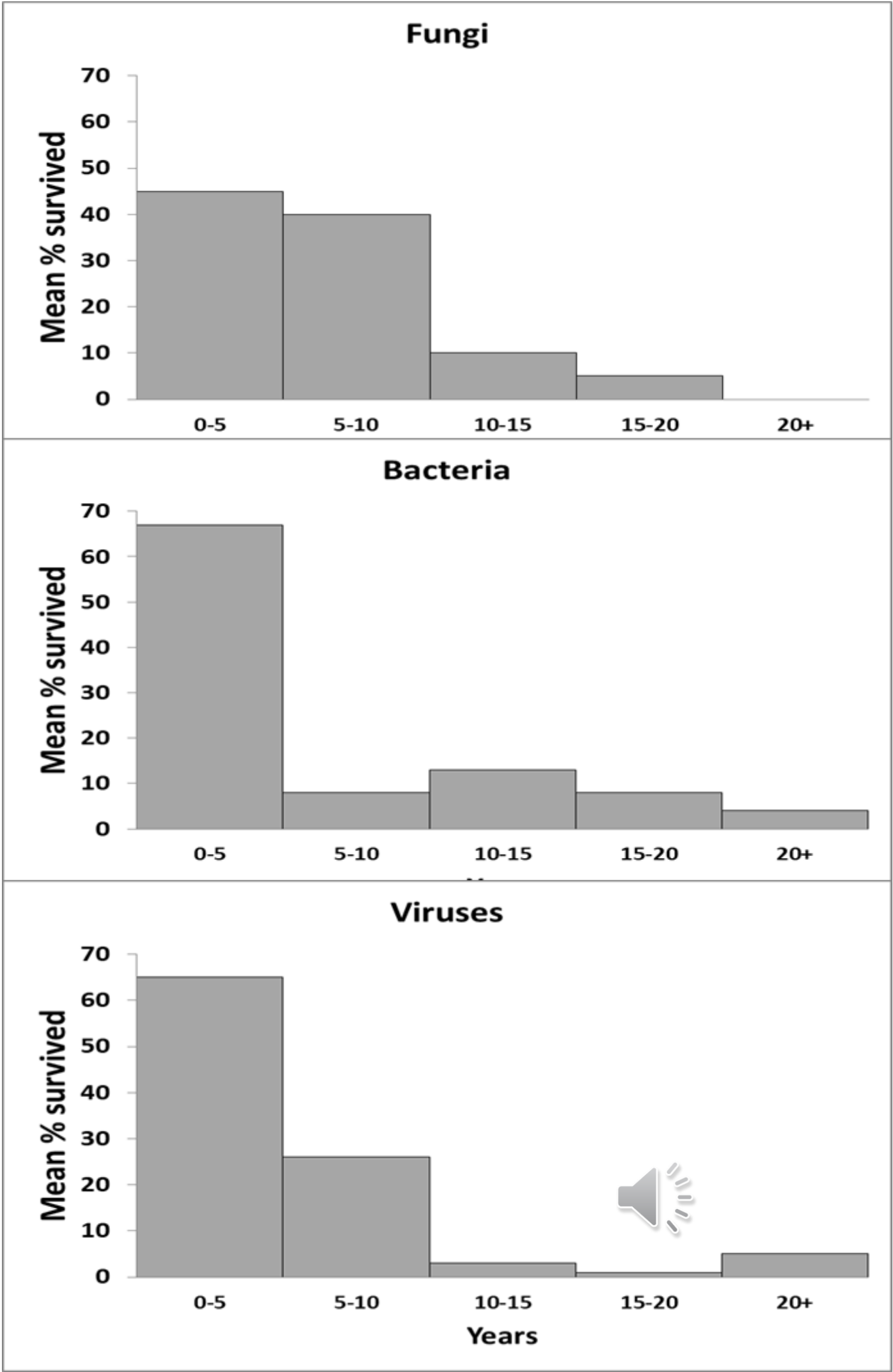
1. **Pathogen** – living organism that causes disease in plants

2. **Type of plant pathogens:**

- **Viroides**
- **Viruses**
- **Phytoplasma**
- **Bacteria**
- **Oomycota**
- **Fungi**
- **Nematodes**

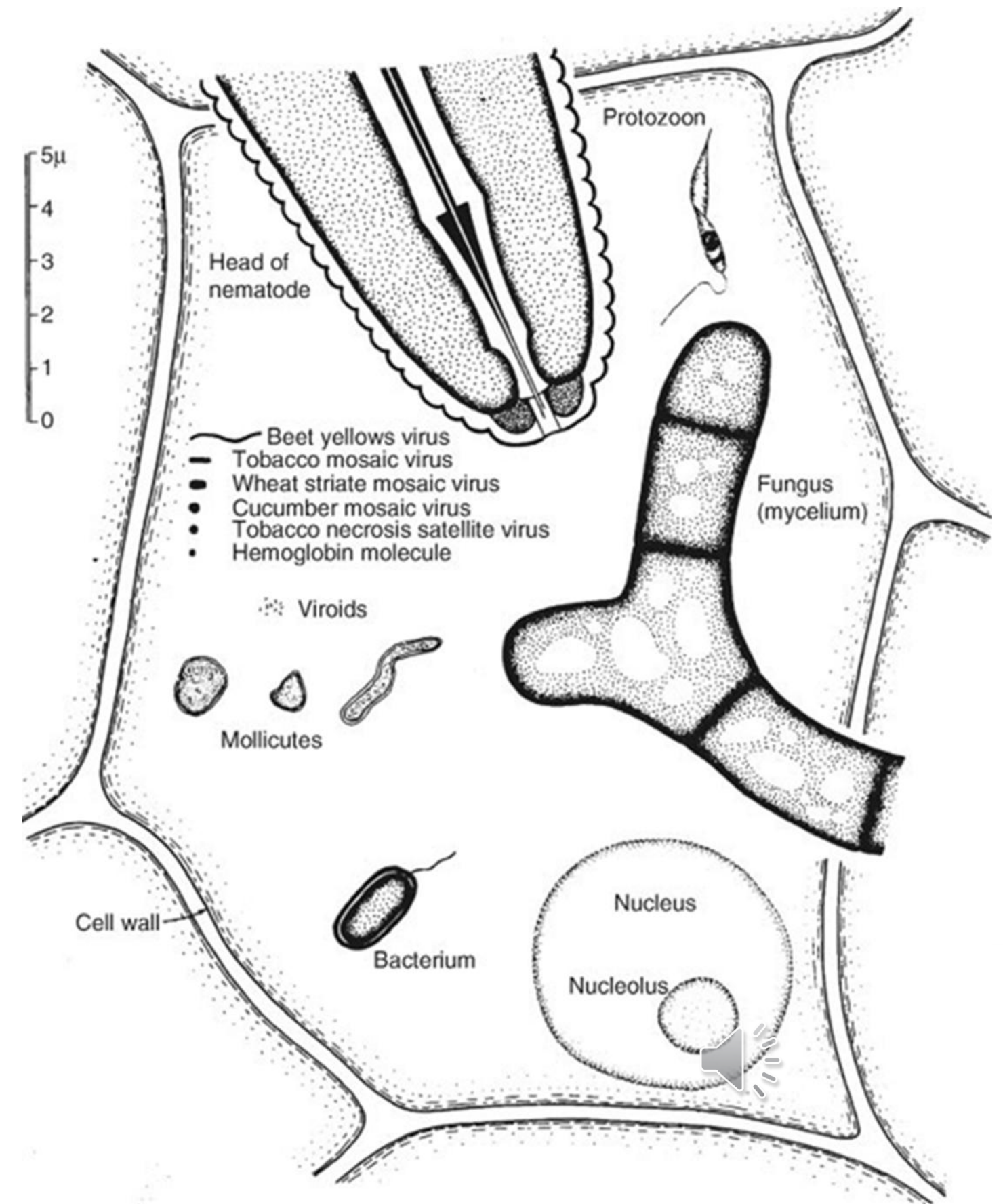


# How long can pathogen remain in seed?



# Where they come from?

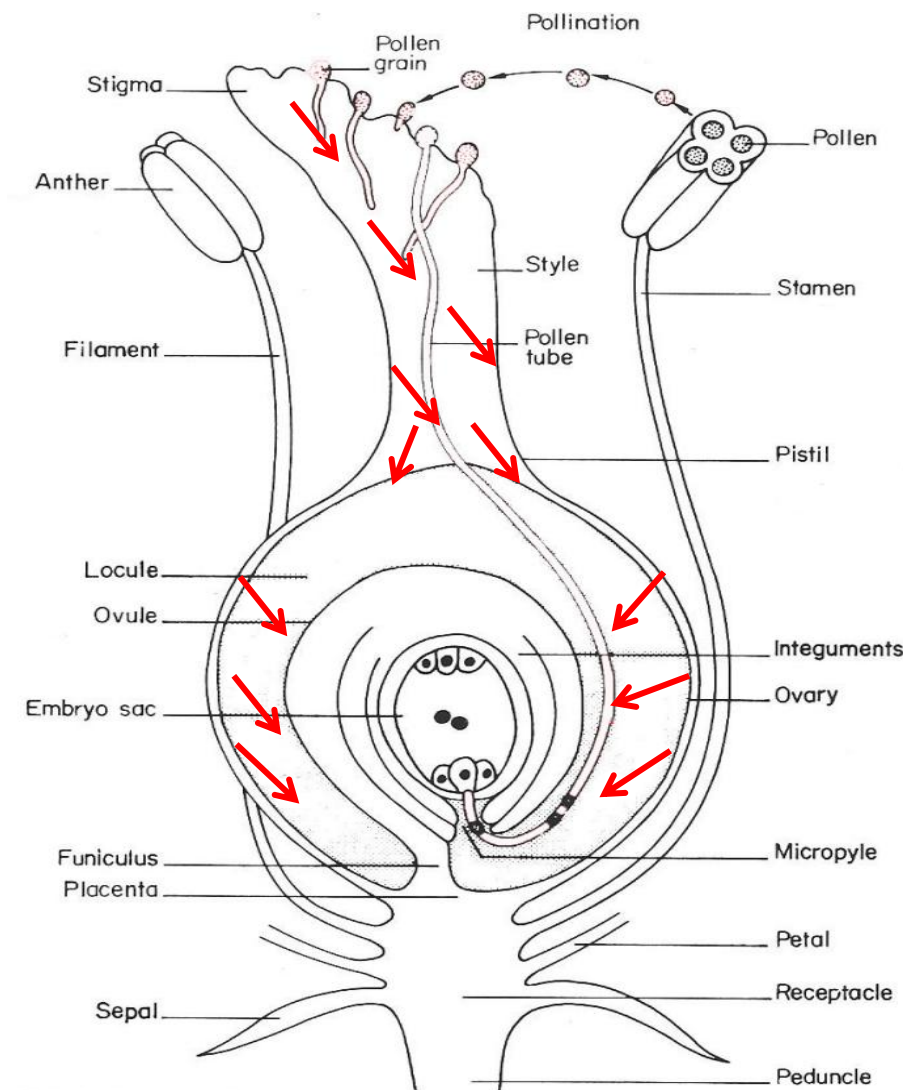
- Parent plant
- Soil
- Crop residues
- Irrigation water
- Other crops
- Weeds
- Insects



# Mechanism of seed infection

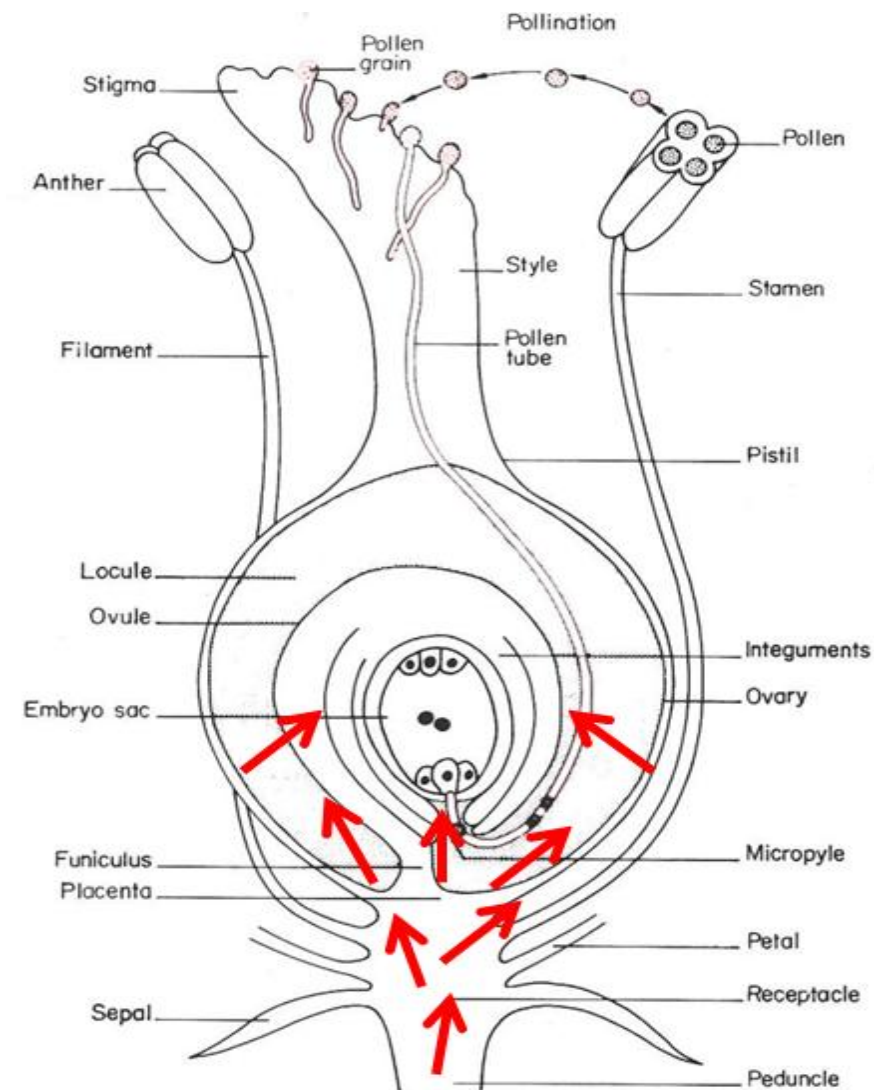
- **Pathogens can infect seeds at all stages of seed development!**
  1. Anthesis – flower development, pollen shed, pollination – smuts, ergots, viruses
  2. Seed development – fertilization to maturity
  3. Seed maturity – physiology maturity to harvest, during drying

# Mechanism of seed infection

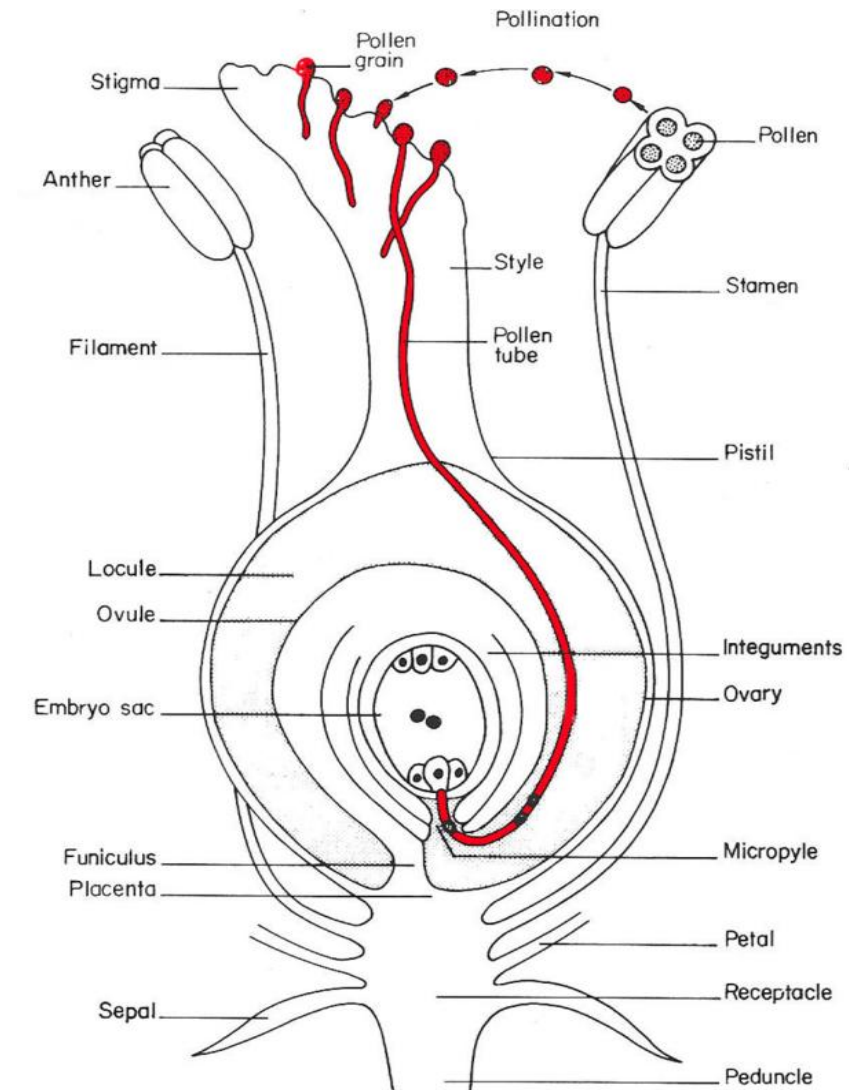


**Infection through stigma, style and ovary**  
(ergots, loos smuts, *Fusarium* spp., *Botrytis*, *Cladosporium variabile*, *Cucumber mosaic virus*)

(Maude, 1996)



**Systemic infection through the mother plant**  
(embryo-borne viruses, bacterial diseases, *Fusarium* spp., vascular wilt fungi)



**Infected pollen**  
(some viruses)

## To summarize:

- Seedborne pathogens are carried by seeds, but not all are transmitted to the plant
- Seed-transmitted pathogens directly infect the emerging plant and can cause disease
- Contamination affects the seed surface, while infection penetrates internal tissues
- Seedborne diseases can reduce germination, yield, and shelf life
- Pathogens can originate from many sources and infect seeds at multiple stages of development

**In the next unit, we will look at contamination thresholds and detection methods, which help us quantify and manage these risks**

