



Training in organic breeding

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

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

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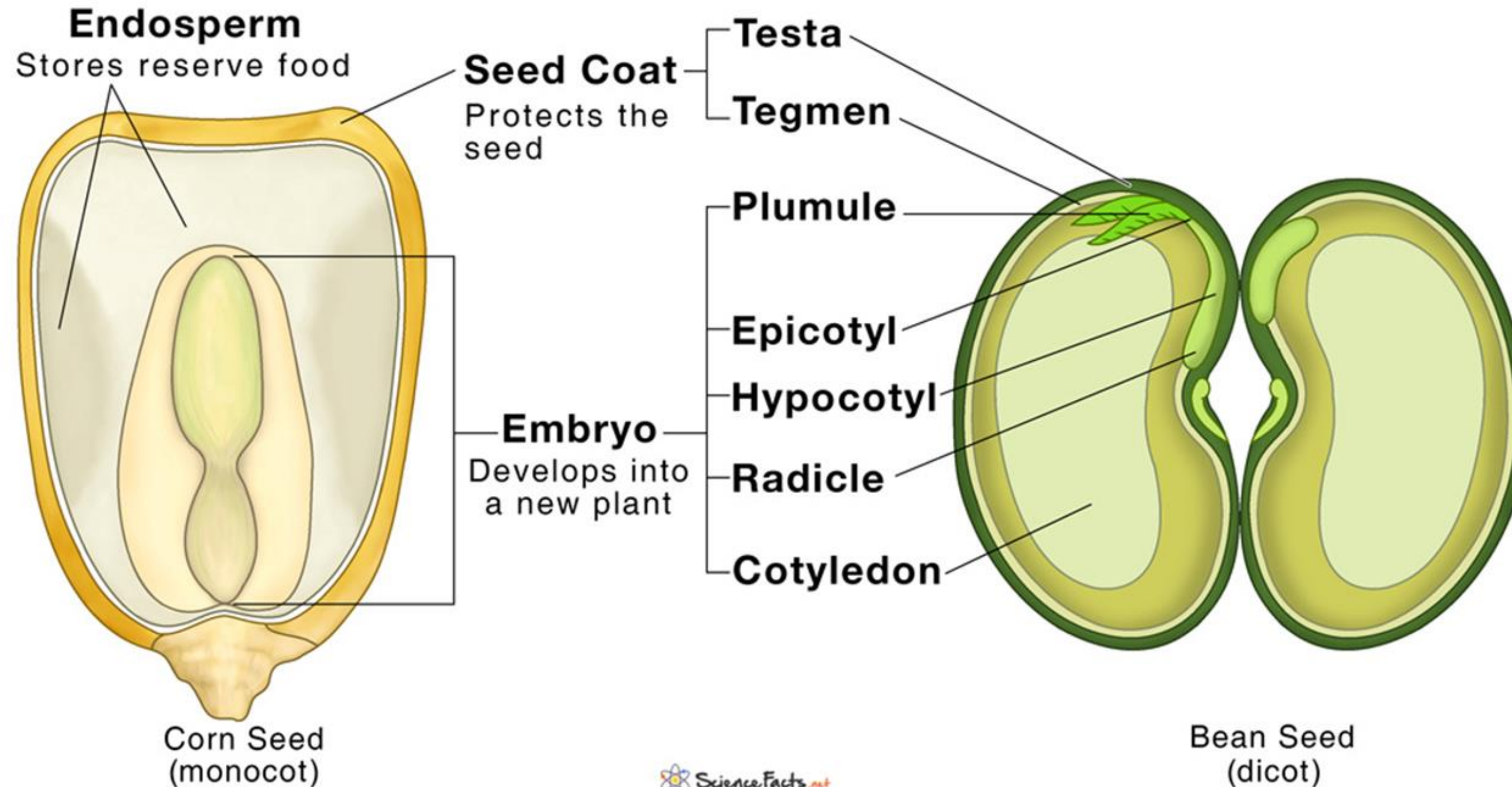
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Parts of a Seed with Functions



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

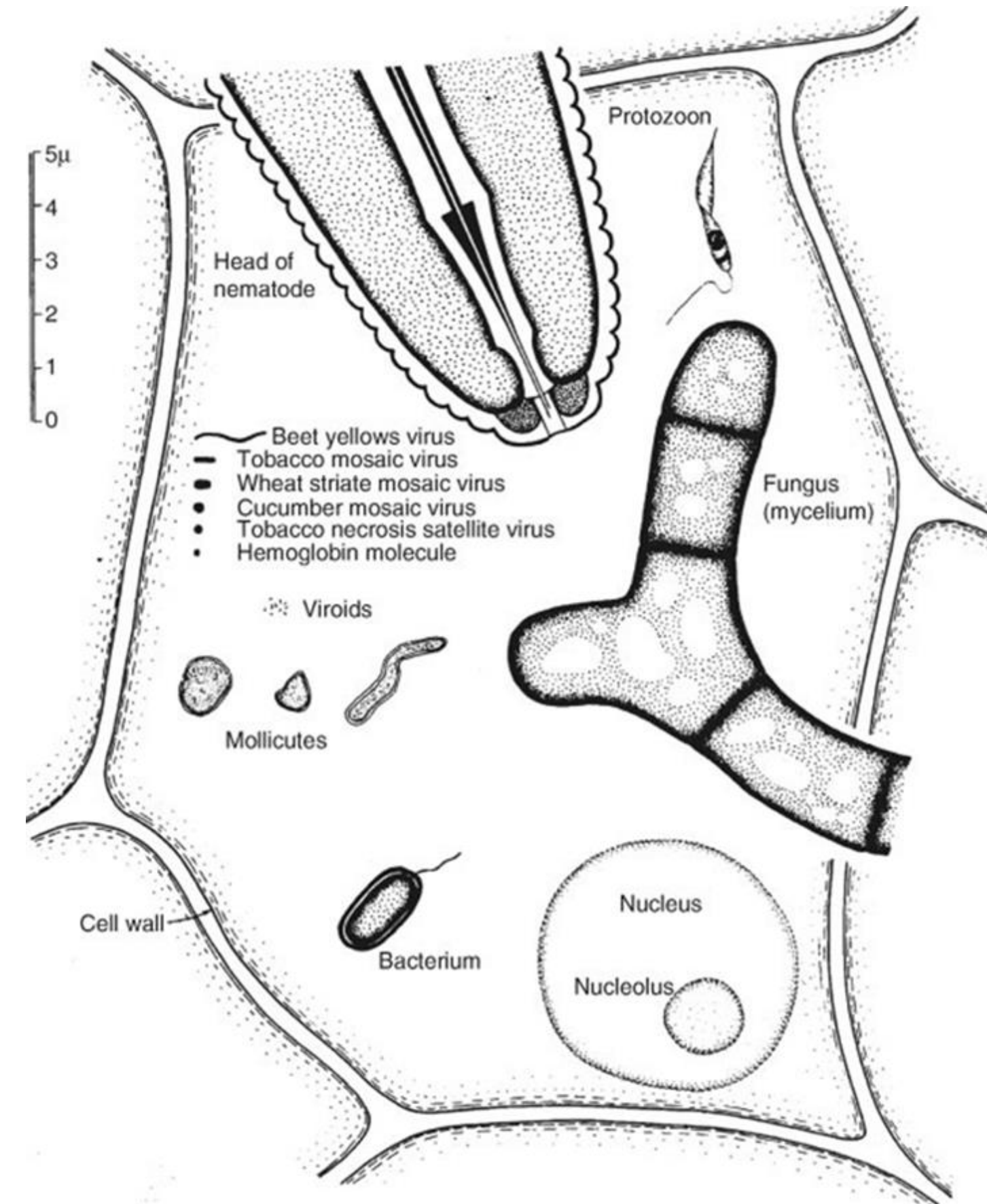
Significance of seedborne diseases

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

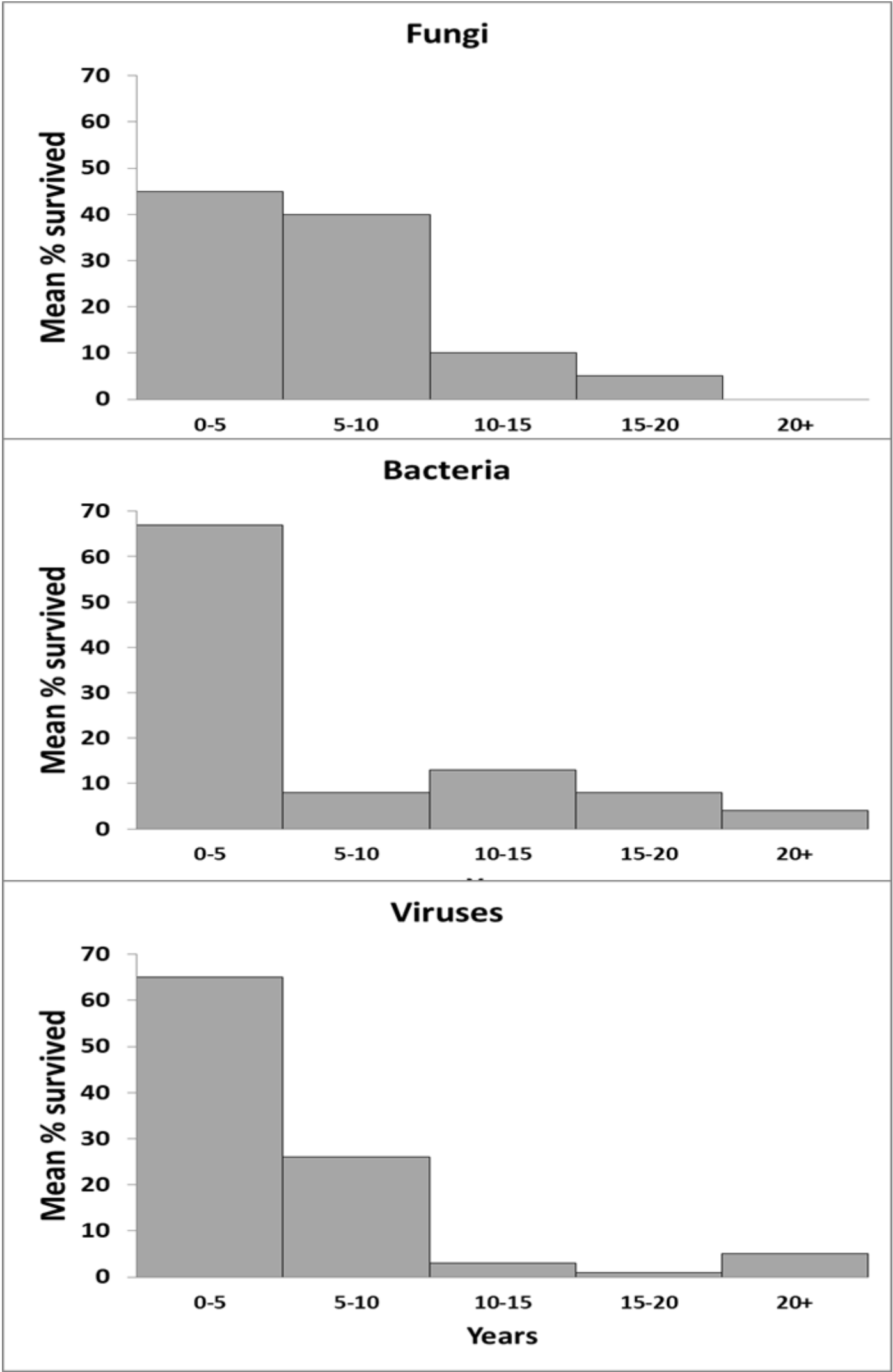
1. **Pathogen** – living organism that causes disease in plants

2. **Type of plant pathogens:**

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

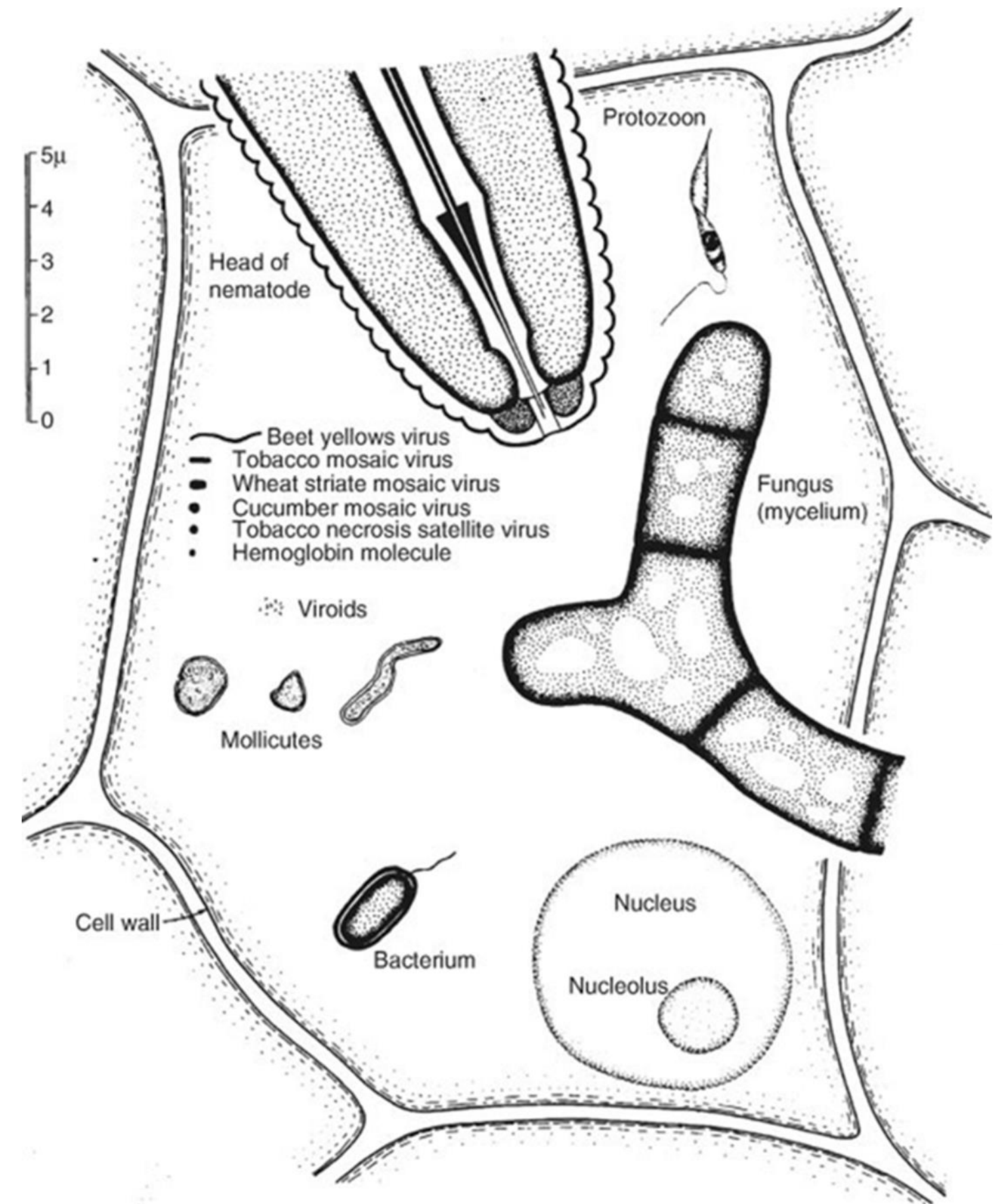


How long can pathogen remain in seed?



Where they come from?

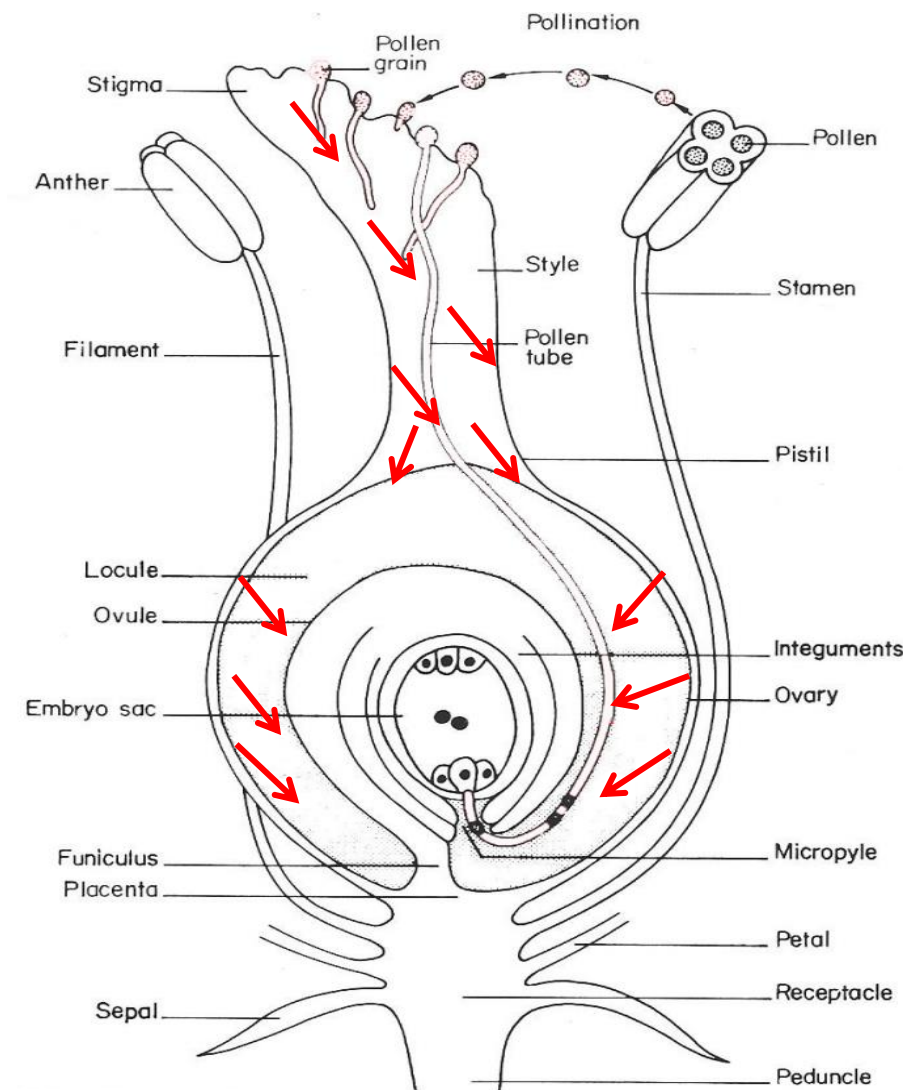
- Parent plant
- Soil
- Crop residues
- Irrigation water
- Other crops
- Weeds
- Insects



Mechanism of seed infection

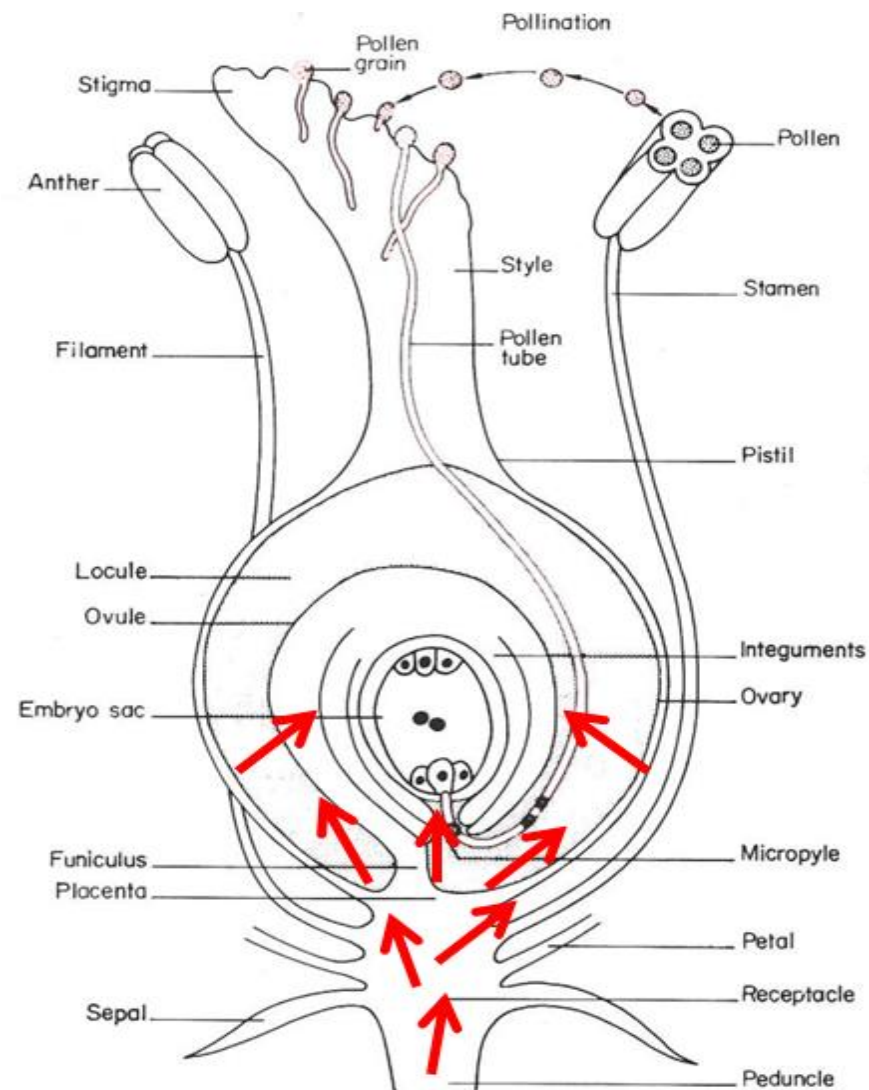
- **Pathogens can infect seeds at all stages of seed development!**
 1. Anthesis – flower development, pollen shed, pollination – smuts, ergots, viruses
 2. Seed development – fertilization to maturity
 3. Seed maturity – physiology maturity to harvest, during drying

Mechanism of seed infection

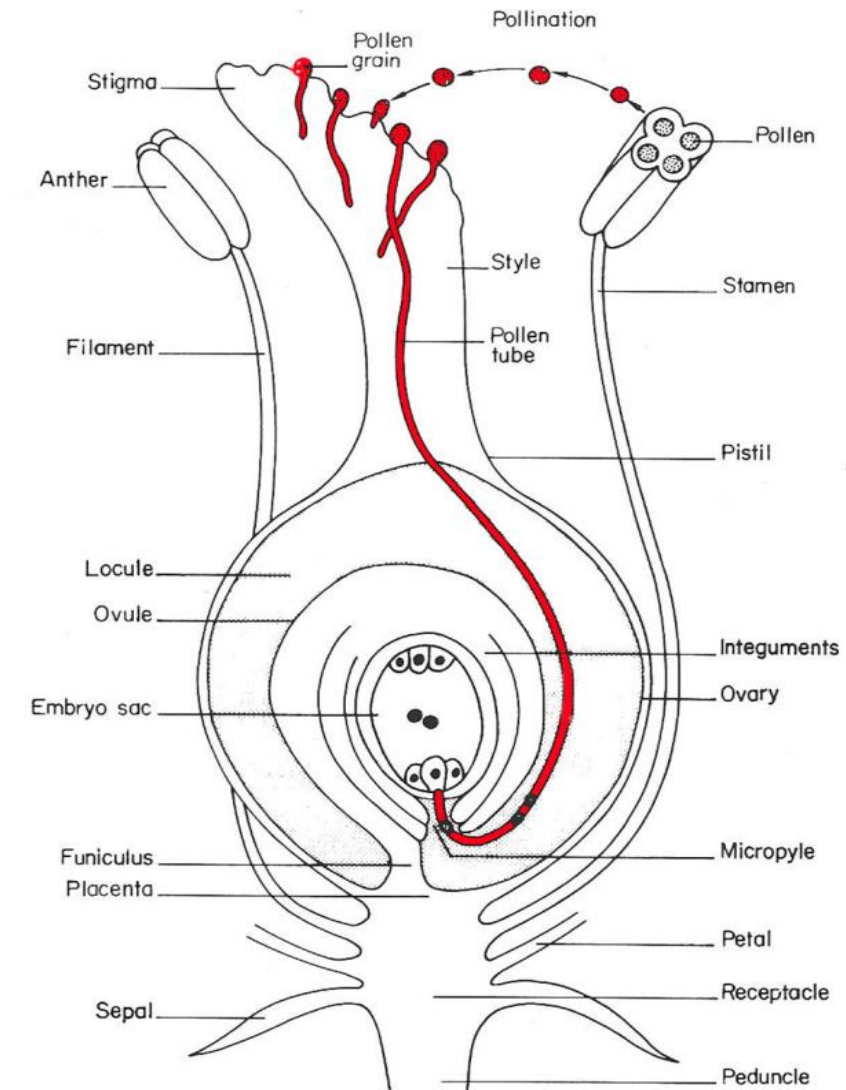


Infection through stigma, style and ovary
(ergots, loos smuts, *Fusarium* spp., *Botrytis*, *Cladosporium variabile*, *Cucumber mosaic virus*)

(Maude, 1996)



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



Infected pollen
(some viruses)

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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 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



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